Shark Bay Terrestrial Reserves and Proposed Reserve Additions

Management Plan No. 75 2012

Department of Environment and Conservation

Conservation Commission WESTERN AUSTRALIA

SHARK BAY TERRESTRIAL RESERVES AND PROPOSED RESERVE ADDITIONS

Management Plan

2012

Department of Environment and Conservation

Conservation Commission of Western Australia

VISION

A place where natural, cultural and world heritage values are protected and enhanced, and where people gain inspiration and enjoyment.

The Shark Bay area is a vast natural landscape and seascape embracing the essence of northern coastal Western Australia. The ancient landscapes and seascapes are recognised for their visual and aesthetic appeal.

In 2022, Shark Bay will remain a place of natural diversity where south-western and arid environments mix and internationally significant threatened and endemic native flora and fauna and vegetation communities are protected and conserved.

Shark Bay will remain a place of nationally significant cultural values, Indigenous and non-Indigenous, requiring protection, appreciation and respect.

Shark Bay will continue to be a place where people can experience, learn and gain an appreciation of natural, cultural and world heritage values, and the need to protect and conserve these values for present and future generations through cooperative management, community involvement and commercial opportunities.

The vision of this plan is derived from community input. The vision also reflects the key values of the planning area and the importance of sustainably managing those values (see Section 4 – *Key Values*).

Front cover images:
Main photo: Big Lagoon, Francois Peron National Park, photo by Rory Chapple, DEC.
Other photos: Shark Bay daisy, photo by Ian Anderson, DEC.
Four-wheel drive, Dirk Hartog Island, photo by Rory Chapple, DEC.

This management plan has been produced on recycled paper.

PREFACE

All national parks, conservation parks and nature reserves in Western Australia are vested in the Conservation Commission of Western Australia (Conservation Commission), and managed by the Department of Environment and Conservation (the Department or DEC) under provisions of the *Conservation and Land Management Act 1984* (CALM Act).

This area management plan is for the terrestrial conservation reserves and proposed reserve additions of the Shark Bay World Heritage Property and the purchased and surrendered part of Murchison House station that is north of the State Barrier Fence.

The Department and the Conservation Commission understands that effective management of the Shark Bay terrestrial reserves and proposed reserve additions depends on the support, cooperation and participation of the community and therefore seeks to ensure that there is ample opportunity for the community to be involved – both in the preparation of the management plan and the ongoing management of the planning area. By working together we can provide for the continued wise use of the planning area whilst ensuring that future generations also have opportunities to appreciate the values of these special areas.

Proposals in this plan have been developed by taking into consideration comments received from the community and key stakeholders during preparation of the draft plan. This included input from a community advisory committee, submissions to a publicly released issues paper, meetings with stakeholders and feedback from community meetings and workshops and public meetings after the draft plans was released.

The management planning process provides the Department and the Conservation Commission with a valuable opportunity to become better informed about the range of public and stakeholder views and to make decisions that are more sensitive and responsive to public concerns. However this process will invariably reveal a wide variety of competing interests and opinions. In these circumstances, the Department and the Conservation Commission are guided by the need to ensure that the key natural and recreation values of the planning area are protected so that they may be appreciated and enjoyed by both present and future generations – other interests can only be accommodated if this can be done without compromising the primary purpose for which an area has been reserved. Similarly, the economic and social interests of the local community, most of who have been attracted to the area by the many values managed by the Department, must also be considered in the context of broader national and global conservation, recreation and tourism interests. In the case of the existing and proposed national parks and conservation parks, this management plan seeks to fulfil demand for recreation by the public that is also consistent with the conservation and restoration of the natural environment, protection of indigenous flora and fauna and the preservation of features of archaeological, historic or scientific interest. For existing and proposed nature reserves, this management plan aims to conserve and restore the natural environment, protect indigenous flora and fauna and the preserve features of archaeological, historic or scientific interest.

The plan has acknowledges that marine and coastal environments are complex, integrated systems and it is essential that management of these areas is also integrated, coordinated and complementary to the terrestrial reserves and proposed reserve additions. To this end, the regional context of the parks and reserves has been a key consideration during the planning process and strategies have been developed with adjacent land and marine uses in mind. Planning for the Shark Bay terrestrial reserves and proposed reserve additions has, for example, sought to ensure seamless management with other managed areas in the region (e.g. the Shark Bay marine parks and reserves and Shire managed lands). The plan recognises the importance of world heritage and has been developed in close collaboration with the development of the *Shark Bay World Heritage Property Strategic Plan* (DEC 2008) and acknowledges other relevant planning documents including the *Shark Bay Regional Strategy* (WA Planning Commission 1997) and *Shark Bay Marine Reserves Management Plan* (CALM 1996b).

The Department and the Conservation Commission will seek to achieve the plan's objectives by taking the actions specified. Improvements in management are planned through adaptive management strategies built into the document. The Department and Conservation Commission are committed to implementing the plan, although priorities for implementing all actions will depend, to some extent, on the provision of necessary resources. Reports by the Conservation Commission on implementation of the plan will make it clear if any actions have not been progressed and for what reasons. In the event that the proposed reserve additions are vested with the Conservation Commission, they would be managed in a manner consistent with this management plan.

Changes since the previous management plan

The existing parks and reserves have been managed according to the *Shark Bay Terrestrial Reserves Management Plan 2000-2009* (CALM 2000) since 2000. In that time there have been a number of developments that have led to differences between the existing plan and this management plan. These include:

- legislative changes, in particular the creation of the Conservation Commission in 2000 and its statutory role in implementing performance assessment of management plans which in turn has led to a focus on outcome-based planning;
- the purchase or surrender of additional lands including Nanga (December 2000), northern part of Murchison House (August 2005), southern part of Tamala (April 2006) and western part of Carrarang (January 2008);
- establishment of the majority of Dirk Hartog Island as a national park on 29 October 2009;
- the 2015 pastoral lease exclusion process. All of the State's pastoral leases will expire in 2015. Some of these have been identified in the State Government's 2015 pastoral lease exclusion process, which identified pastoral lands that would contribute towards the establishment of a comprehensive, adequate and representative (CAR) reserve system and provide for future sustainable tourism and recreation use (DPI 2005);
- the State Government's acknowledgement of the interests of Aboriginal people in the management of conservation lands; and
- increased knowledge of the values of the Shark Bay area, in particular the completion of the report *Biodiversity of the southern Carnarvon Basin* in 2000.

ACKNOWLEDGEMENTS

This plan was prepared by the Shark Bay planning team comprising Paul McCluskey, Clare Anthony, Kelly Gillen, Sue Hancock, Dave Rose, Cheryl Cowell and Brett Fitzgerald. Technical assistance was provided by Simon Kilbane, Tracy Churchill, Eleanor Reuvers, Gil Field, Burke Stephens, Melissa Robinson, Aaron River, Holly Smith, Marguerite D'Alton and Jack Green.

Many people have provided valuable assistance in the preparation of this plan, particularly:

- members of the Shark Bay Terrestrial Reserves Community Advisory Committee comprising Mr Kelly Gillen (Chair), Mr Ben Bellottie, Mr Barry Edwards, Mr Phil Thomson, Dr Per Christensen, Dr Sue Graham-Taylor, Ms Fiona Shallcross, Mr Mike Flood and former members Ms Jenny Payet, Ms Alex Maslen and Mr Bill Carr (Conservation Commission); and
- staff of the Department's Shark Bay District, Midwest Region, Science Division, Nature Conservation Division, Parks and Visitor Services Division, Fire Management Services, and Information Management Branch.

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority.

The Department of Environment and Conservation is referred to as the 'Department'.

The 'planning area' or 'management plan area' refers to the existing terrestrial reserves of Francois Peron National Park, Dirk Hartog Island National Park, Shell Beach Conservation Park, Zuytdorp Nature Reserve, Bernier and Dorre Islands Nature Reserve and other islands nature reserves, and the proposed terrestrial reserve additions including part South Peron (generic name applied to area that was part of former Peron Station and south of Denham), Nanga, part Tamala, part Murchison House and part Carrarang (see Map 1).

When 'Shark Bay area' is used in this plan it refers to all the marine and terrestrial area bounded to the west and north by the Shark Bay World Heritage Property, the east by the North West Coastal Highway and the south by the State Barrier Fence.

When 'region' is used in this plan it refers to the Gascoyne region used by the Western Australian Planning Commission and Gascoyne Development Commission. This provides an appropriate scale for this plan to link with regional development and planning for local government. The 'region' follows the boundaries of the Shires of Exmouth, Shark Bay, Carnarvon and Upper Gascoyne. The Department's regional boundaries for this area are referred to as the 'Midwest Region' and do not coincide with the Gascoyne Region.

The Shark Bay World Heritage Property or 'Property' refers to the area outlined in the 1997 State-Commonwealth Agreement. It includes both terrestrial and marine areas and extends from Carnarvon and Bernier-Dorre Islands in the north to Zuytdorp Nature Reserve in the south and follows the coastline (see Maps 1 and 2).

Edel Land for the purposes of this management plan refers to the north western part of the Carrarang pastoral lease that has been surrendered.

Aboriginal place names can be spelt in numerous ways (for example Nanda or Nhanda). These spellings should be seen to encompass all other spellings.

CONTENTS

FIGURES

TABLES

MAPS

PART A. INTRODUCTION

1. BRIEF OVERVIEW

Shark Bay is located on the westernmost point of Australia, about 800 km north of Perth (see Map 1). Apart from the Murchison House acquisition, the planning area is located within the Shark Bay World Heritage Property (SBWHP). The Property covers approximately 2.2 million hectares of land and water.

The existing terrestrial reserves in the planning area comprise Francois Peron National Park, Dirk Hartog Island National Park, Bernier and Dorre Islands Nature Reserve, other islands nature reserves, Shell Beach Conservation Park and Zuytdorp Nature Reserve. Currently the total area of existing Department-managed terrestrial reserves in Shark Bay area is about 175,000 hectares.

The proposed reserve additions have been identified in:

- the Conservation Reserves for Western Australia Systems 9 report (EPA 1976);
- subsequent planning documents (e.g. *Shark Bay Region Plan* (State Planning Commission 1988), *Shark Bay Regional Strategy* (WA Planning Commission 1997), *Shark Bay Terrestrial Reserves Management Plan* (CALM 2000), *Shark Bay World Heritage Property Strategic Plan* (DEC 2008a); and
- the 2015 pastoral lease exclusion for public purpose process.

During the process for renewing pastoral leases beyond 2015, the Department identified lands that would contribute towards a comprehensive, adequate and representative (CAR) reserve system and provide for future sustainable tourism and recreation use, both terrestrial and marine (CALM 2003). These lands for public purpose were to be excluded when pastoral leases were renewed in 2015 but could be surrendered earlier than this date.

In the planning area, additional land purchases or surrenders for conservation include Nanga pastoral lease (December 2000), part Murchison House (August 2005), part Tamala (April 2006) and part Carrarang (January 2008). On 29 October 2009 the majority of Dirk Hartog Island was created as a national park. The management plan proposes vesting, purpose and land tenure of the majority of the unallocated Crown land (UCL) area known as South Peron. With these proposed reserve additions, the total area of Department-managed terrestrial reserves in the Shark Bay area will be about 520,000 hectares.

Visitors are attracted to the area's natural attributes and the largely undeveloped environment. In the past, visitors went to Shark Bay primarily for fishing and the human-dolphin interaction at Monkey Mia, but there is increasing demand and expectation for experiencing other natural features of the area. It is essential that recreation and tourism are managed so that the attractions upon which tourism is based are not degraded. It is also important to ensure that other industries and activities do not have an adverse impact on the area's tourism attractions.

The *Shark Bay Terrestrial Reserves Management Plan 2000-2009* (CALM 2000) was released in 2000. The additional estate and need to resolve land tenure and use issues, particularly in South Peron, has prompted the Conservation Commission, through the agency of the Department, to prepare a new terrestrial management plan.

Once finalised, this management plan will provide more effective and relevant guidelines to protect the key values of the planning area including all the existing and proposed reserves listed in Section 3 – *Management Plan Area*. In addition, the objectives and strategies in this plan may guide the management of any other additions to the public conservation estate that may occur over the life of the plan, whether they are located within or adjacent to management plan area boundary (see Map 1). This plan should not be viewed in isolation but as an integral part of management regimes that occur in adjacent and related areas.

The implementation of this plan will be undertaken primarily by the Department's Shark Bay District office in Denham as well as the regional office in Geraldton and the work centre in Carnarvon.

World Heritage Property

Shark Bay was inscribed on the World Heritage List on 13 December 1991 on the basis of its "natural heritage" values. At the time of listing, Shark Bay was Australia's tenth and Western Australia's only World Heritage Property and was one of just 11 places globally to satisfy all four of the natural criteria for World Heritage listing. As at August 2010 there were, globally, 180 World Heritage sites listed on the basis of only natural heritage values, with a further 27 sites listed on the basis of both natural and cultural heritage values.

The planning area is valued for its diverse range of landforms and exceptional scenic qualities. The area is of major botanical and zoological importance, and contains many threatened species. Several reserves have important associations with the area's cultural heritage. At the time when Shark Bay was inscribed on the World Heritage List, the site contained and satisfied the four natural criteria of:

- outstanding examples representing the major stages of the earth's evolutionary history; or
- outstanding examples representing significant ongoing geological processes, biological evolution and human interaction with the natural environment; or
- superlative natural phenomena, formations or features (e.g. outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements); or
- the most important and significant habitats where threatened species of animals and plants of outstanding universal value from the point of view of science and conservation still survive.

The Shark Bay World Heritage Property (see Map 2) covers approximately 2.2 million hectares of land and water. The existing terrestrial reserves covered by this management plan comprise about 5.5 per cent of the World Heritage Property, or 19.5 per cent of the terrestrial component.

Each of the terrestrial reserves contains features which meet at least one of the World Heritage criteria. Some of the reserves' key World Heritage values are:

- the peninsulas and islands which provide refuge for migratory and threatened fauna, including five threatened mammal species on Bernier and Dorre Islands Nature Reserve, and breeding sites for seabirds;
- exceptional scenery including part of the Zuytdorp Cliffs, Shell Beach and the birridas, lagoons and coastal cliffs of Peron Peninsula; and
- the botanical transition zone between the Eucalypt dominated Southwest Botanical Province and the Acacia dominated Eremaean Botanical Province.

The *Agreement between the State of Western Australia and the Commonwealth of Australia on Administrative Arrangements for the Shark Bay World Heritage Property* (1997 State-Commonwealth Agreement), signed on 12 September 1997, established a Shark Bay World Heritage Property Ministerial Council as well as a Community Consultative Committee and a Scientific Advisory Committee to advise the Ministerial Council. The agreement also commits to the development of a strategic plan for the entire World Heritage Property, in order to provide an overall framework to ensure the identification, protection, conservation, presentation and, where necessary, rehabilitation of the Property's outstanding universal values. Other Plans affecting the Property must be consistent with the Strategic Plan and also consistent with Australia's obligations under the World Heritage Convention, in particular, ensuring the protection, conservation, presentation and transmission to future generations of the property's outstanding universal values.

The *Shark Bay World Heritage Property Strategic Plan 2008-2020* (DEC 2008a) provides direction for the management of resources across the Property. The strategies in this management plan are consistent with the strategic direction for the management of the Property. Should the terrestrial reserves management plan display any significant inconsistencies, these can be rectified via the management plan amendment process provided for in the provisions of the CALM Act.

2. REGIONAL CONTEXT

The planning area occurs mostly within the Shire of Shark Bay with the exception of Bernier, Dorre and Koks Islands which are located within the Shire of Carnarvon and the part of Murchison House station north of the State Barrier Fence which is located in the Shire of Northampton. It is also primarily located in the Western Australian Planning Commission's Gascoyne Region.

The population of the Shark Bay Shire is estimated to be 863 (source: Bureau of Statistics 2006 census) with Denham having most of this population and the privately operated mining town of Useless Loop approximately 100. The Shire of Carnarvon has a population of 6159 (source: Bureau of Statistics 2006 census). Tourist accommodation is provided at Monkey Mia, Nanga and Dirk Hartog Island, with camping available at various sites including Francois Peron National Park, Edel Land, Dirk Hartog Island and Tamala Station. The remainder of the World Heritage Property is sparsely inhabited by predominantly the pastoral community.

Shark Bay supports a range of industries and the region's economy is, in terms of value, largely based on fishing, tourism, salt production, shell mining, pastoral activities and aquaculture. Many of the region's existing and potential industries are dependent on maintaining the area's unique biological and geological values. The tourism industry in Shark Bay has great potential for economic development and the local economy is becoming increasingly dependant on tourism. Expansion of the salt mining operation at Useless Loop is proposed and mineral sand mining exploration is occurring in an area adjacent to the World Heritage Property.

A number of local, State Government and commercial services are provided in Denham and Carnarvon including schools (a primary school is also located at Useless Loop), electricity generation and water supplies. The surrounding marine and terrestrial environment of the Shark Bay area is an important recreational resource for residents of the area.

Shark Bay is the site of first European landfall in Western Australia in 1616 and site of first physical evidence of European landing in Australia[1]. The studies and collections made by explorers represent some of the earliest records of Australia's flora and fauna. This has been recognised through the listing of the northern tip of Dirk Hartog Island on the National Heritage List in 2006.

Commercial fishing is recognised as an important social and economic component of the Shark Bay area. However, fishermen who operate in waters of Shark Bay do not necessarily reside in Denham. In addition recreational fishing makes a significant contribution to the local economy.

Tourism is the biggest industry in Shark Bay in terms of employment, and makes a major contribution to the local economy. Using data from Tourism Western Australia visitor surveys from the two year (2004-05) rolling average, there were 127,100 overnight visitors to the Shark Bay area (domestic 80,500 and international 46,600) (TWA 2006). Recreational and tourism activities are generally centred on the natural land and marine environment.

The most significant mineral development in Shark Bay is the solar salt operation at Useless Loop. This area is excluded from the World Heritage Property. Almost all the salt is sold for export, with about 40 ship loadings per year. Coquina shell is mined at L'haridon Bight and the material has been used around the Shark Bay area for many years for landscaping, footpaths, as aggregate in concrete, as a primary road surface, and as shell grit.

3. MANAGEMENT PLAN AREA

The management plan area consists of existing conservation reserves and proposed conservation reserve additions north of the State Barrier Fence and within the Shark Bay World Heritage Property and includes (see Maps 1 and 2):

Existing terrestrial reserves

- Francois Peron National Park (Reserve 42471); 52,528.6 hectares, for the purpose of 'national park';
- Dirk Hartog Island National Park (Reserve 50325), 62,920 hectares, for the purpose of 'national park';
- Shell Beach Conservation Park (Reserve 42443) 517.8 hectares, for the purpose of 'conservation park';
- Zuytdorp Nature Reserve (Reserve 34771); 58,850 hectares, for the purpose of 'Conservation of Flora and Fauna';
- Bernier and Dorre Islands Nature Reserve (Reserve 24869), 9,719.8 hectares, for the purpose of 'Conservation of Flora and Fauna';
- Koks Island Nature Reserve (Reserve 33901), 2.6 hectares, for the purpose of 'Conservation of Flora and Fauna';
- Friday Island Nature Reserve (Reserve 33829), 0.8 hectares, for the purpose of 'Conservation of Flora and Fauna';

[1] Willem Jansz in the Duyfken reportedly landed on the western side of Cape York Peninsula in 1606.

- Charlie Island Nature Reserve (Reserve 33828), 0.9 hectares, for the purpose of 'Conservation of Flora and Fauna'; and
- Baudin, Double, Egg, Freycinet, Mary Anne, North Guano, Pelican, Salutation, South Guano, Sunday, Three Bays, White & Wilde Islands Nature Reserve (Reserve 26004), total 205.6 hectares, for the purpose of 'Conservation of Fauna and Collection of Guano'.

Proposed terrestrial reserve additions

- former Nanga pastoral lease (176,408 hectares) - purchased in January 2000;
- part Murchison House pastoral lease (37,578 hectares) - purchased in August 2005;
- part Tamala pastoral lease (56,343 hectares) - purchased in April 2006;
- part Carrarang pastoral lease (18,772 hectares) - purchase and surrender to be negotiated;
- part of South Peron UCL - extent to be negotiated with Shire of Shark Bay and the Department for Planning and Infrastructure (DPI); and
- other un-named islands, islets and rocks.

Collectively these areas are referred to as the 'planning area' and occupy a total of about 520,000 hectares.

The management plan applies to existing terrestrial conservation reserves and the proposed terrestrial reserve additions listed above. In addition, the management plan may apply to any other terrestrial reserve additions that may occur in the future within or adjacent to the management plan area boundary. The objectives and strategies of this plan may be applied to these additional areas.

4. KEY VALUES

The key values associated with the Shark Bay terrestrial reserves and proposed terrestrial reserve additions include:

World Heritage

A detailed description of the natural heritage values and justification for World Heritage listing is contained in the nomination document for the Shark Bay World Heritage Property. The information provided in the nomination reflected the state of knowledge at the time of preparation in 1990, however, in some instances this has been superseded by new knowledge. A brief summary of the values is provided below.

Criterion 1: Outstanding examples representing the major stages of the earth's evolutionary history.

- Stromatolites and microbial mats of Hamelin pool;
- Hamelin Pool and L'haridon Bight and Holocene deposits.

Criterion 2: Outstanding examples representing significant ongoing geological process, biological evolution and man's interaction with his natural environment.

Marine Environment

- Unique hydrological structure, banks and sills, steep salinity gradients, three biotic zones;
- Faure sill;
- Hypersaline environment of Hamelin Pool;
- Microbial communities;
- *Fragum eragatum* shell deposits;
- High genetic biodiversity (e.g. snapper, venerid clams, bivalves);
- Seagrass meadows, and their role in the evolution of the marine environment;
- Wooramel seagrass bank, expanse of meadows and diversity of seagrass species;
- Carbonate deposits and sediments;
- Northern limit of transition region between temperate and tropical marine environments, resulting in high species diversity (e.g. 323 fish species, 218 bivalve species, and 80 coral species).

Terrestrial Environment

- Botanical province transition zone, most pronounced in the southern parts of Nanga and Tamala;
- Range limits (145 plant species at northern limit, 39 species at southern limit, and 28 vascular plant species endemic);
- Isolation of fauna habitats on islands and peninsulas resulting in survival of threatened species;

- Range limits and fauna species richness (100 species of herpetofauna – 9 endemics, 230 species of birds representing 35% of Australia's total species);
- Species evolution illustrated in rufous hare wallaby and banded hare wallaby.

Criterion 3: Superlative natural phenomena, formation or features, for instance, outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements.

- Stromatolites;
- Hypersaline environment of Hamelin Pool;
- Faure sill;
- Wooramel seagrass bank;
- Coastal scenery - Zuytdorp cliffs, Dirk Hartog Is, Peron Peninsula, Heirisson and Bellefin Prongs;
- *Fragum* (shell) beaches of L'haridon Bight;
- Inundated birridas and lagoons such as Big Lagoon;
- Strongly contrasting colours of the dunes/cliffs, beaches and adjacent ocean of Peron Peninsula;
- Abundance of marine fauna (dugongs, dolphins, sharks, rays, turtles and fish);
- Annual wildflower season display.

Criterion 4: The most important and significant natural habitats where threatened species of animals or plants of outstanding universal value still survive.

- Five out of Australia's 26 endangered mammals (Shark Bay mouse, banded hare-wallaby, rufous hare-wallaby, Western barred bandicoot, and burrowing bettong) survive in Shark Bay;
- Bernier Island subspecies of ash-grey mouse;
- 12 threatened reptiles (e.g. Baudin Island skink and woma);
- 35 migratory bird species;
- Threatened thick billed grasswren;
- Threatened malleefowl;
- Endemic Dirk Hartog Island subspecies of the southern emu-wren;
- Dugong (approx. one eighth of the world's population);
- Humpback whale;
- Loggerhead and green turtles;
- Threatened flora species; and
- Recent important populations established of other nationally threatened species; greater bilby (Francois Peron National Park), greater sticknest rat (Salutation Island, Faure Island and Heirrison Prong).

Natural

- the most diverse and abundant examples of stromatolitic microbiolites in the world with analogous structures of the dominant benthic ecosystem on Earth for 3000 million years (a World Heritage natural value);
- a transition zone between major ecological provinces (both marine and terrestrial) and is of great scientific interest for the study of biogeography including the evolution and extinction of species, the effects of isolation, succession, diversity and other factors such as effects of steep environmental gradients (a World Heritage natural value);
- an area where the temperate climate of the southern part of Australia gives way to semi-desert climates and where a transition zone occurs between two major botanical provinces - the South West dominated by Eucalyptus species and the Eremaean dominated by Acacia species;
- areas of exceptional coastal scenery, the largest seagrass meadow in the world, marine waters that are hypersaline with salinities almost twice that of seawater and the Wooramel Seagrass bank which is one of the few marine areas of the world dominated by carbonates (World Heritage natural values);
- Pelican Island, the largest breeding site for pelicans in Western Australia; and
- marine and terrestrial habitat for many species of plants and animals that are recorded as rare or threatened including:
  - on its islands, 5 of the 26 species of Australian mammals on the International Union for Conservation of Nature (IUCN) Red List of Threatened Mammals;
  - two threatened endemic land reptiles;
  - 67 species migratory birds that are protected by international agreements with a number of bird species listed as threatened at the national level;
  - nesting populations of the green and loggerhead turtles, listed as endangered and vulnerable by IUCN;

- many species of plants that are rare, threatened, little known, undescribed or endemic to the area with 25 per cent of Shark Bay's flora at the end of its range at Shark Bay, representing 145 species of plant at their northern limit and 39 species at their southern limit.

Importantly these habitats occur in the biogeographically significant transition zone between the south-west and arid zones (a World Heritage natural criterion).

Cultural

- confirmed evidence of Pleistocene occupation by Aboriginal people (30,000 years before present) based on a marine economy;
- over 80 known midden sites located in areas adjoining the coastline;
- site of Lock Hospitals on Bernier and Dorre Islands;
- presence of many registered sites protected under the Aboriginal Heritage Act and listed on the Register of the National Estate;
- Dirk Hartog Island is the site of first known European landfall in Western Australia in 1616 and site of first physical evidence of European landing in Australia;
- listing of the northern tip of Dirk Hartog Island on the National Heritage List;
- site of studies and collections made by explorers representing some of the earliest records of Australia's flora and fauna;
- cultural heritage associated with the fishing, pastoral and mining (Guano) industries;
- presence of several historic shipwreck sites; and
- potential for some form of cooperative management between the Department and the Malgana and Nanda people, the traditional custodians for the majority of the planning area.

Recreation and Tourism

- terrestrial environments and proximity to marine environments that offer varied nature-based recreational and tourism opportunities and experiences;
- opportunities for viewing a diverse range of native marine and terrestrial flora and fauna; and
- remote and natural qualities of parts of the planning area.

Educational

- opportunities for education and interpretation of World Heritage and natural values to visitors;
- opportunities for education and interpretation of cultural values, both Indigenous and non-Indigenous, to visitors; and
- opportunities to educate visitors about the unique terrestrial and marine environments and some unique wildlife.

Community

- opportunities for community involvement in activities and experiences in nature conservation and visitor services; and
- opportunities for the involvement of individuals in the various committees associated with the management of parks and reserves.

Monitoring and Research

- extensive research already undertaken and accumulated knowledge of Shark Bay; and
- opportunities for research and monitoring of the unique World Heritage, natural, recreation and cultural values.

Economic

- opportunities to establish tourism businesses based on the unique World Heritage, natural and cultural values.

PART B. MANAGEMENT DIRECTIONS AND PURPOSE

5. LEGISLATIVE FRAMEWORK

Planning for conservation reserves occurs at a number of levels. Management plans are a part of a broad suite of planning undertaken by the relevant managing agencies. Figure 1 illustrates the planning levels typically undertaken for conservation reserves. This shows that management plans are guided by legislation and policy and in turn provide guidance for subsidiary management documents such as fire response plans, weed and feral animal control plans and recreation site development plans.

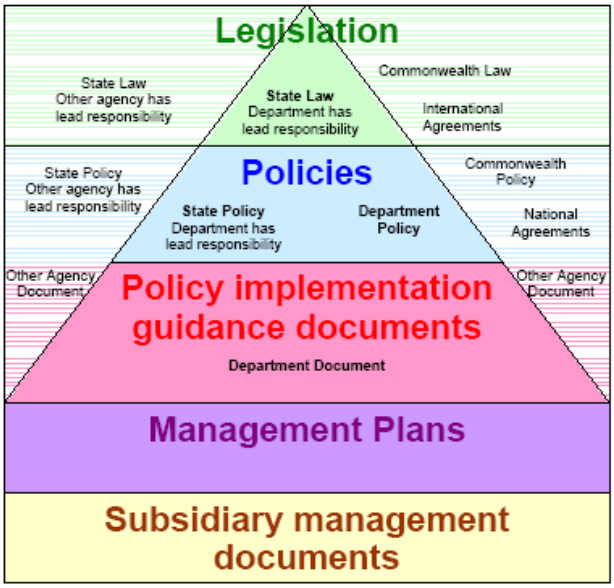


Figure 1: Management Planning Hierarchy

Legislation

The CALM Act establishes the Conservation Commission of Western Australia (Conservation Commission). The lands vested in the Commission are managed by the Department. On behalf of the Conservation Commission, the Department prepares regional, specific area or several areas within a defined geographic area plans on a priority basis. The Conservation Commission issues draft plans for public comment and provides a final plan for approval by the Minister for Environment.

The CALM Act governs the declaration and management of protected areas and in the process imposes certain obligations relating to management planning of these areas. With regard to management plans, Sections 54-56 of the Act specify that:

- the Conservation Commission is responsible for the preparation of management plans, through the agency of the Department, for all land vested in it;
- a management plan must contain a statement of policies or guidelines to be followed in the management of the area, and a summary of the operations proposed to be taken over the life of the plan;
- a management plan for a national park or conservation park shall be designed to "*…fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest*";
- a management plan for a nature reserve shall be designed to "*…to maintain and restore the natural environment, and to protect, care for, and promote the study of, indigenous flora and fauna, and to preserve any feature of archaeological, historic or scientific interest*".

The procedure to make an amendment to a gazetted management plan is governed by section 61 of the CALM Act and involves a public consultation process.

The CALM Act also covers such matters as defining categories of lands and waters managed by the Department (see Section 10 – *Land Tenure and Classification*), establishing controlling bodies, establishing and defining the functions of the department and the controlling bodies, management planning and auditing, permits, licences, contracts, leases, offences and enforcement.

The *Wildlife Conservation Act 1950* (Wildlife Conservation Act) provides for specific protection of native flora and fauna on all lands and waters within the State boundaries. The Department is responsible for the administration of this Act and associated regulations for the conservation and protection of indigenous flora and fauna on all lands and waters within the State.

The (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) contains provisions relating to the protection of nationally-listed threatened species and ecological communities and listing of key threatening processes. It also provides for heritage protection including world heritage properties, national heritage places and lists key threatening processes. The provisions of the EPBC Act require referral to and consultation with the relevant Commonwealth Minister responsible for this Act unless under section 46, an action is approved under and taken in accordance with a State management plan that is accredited by the Commonwealth. Therefore this management plan is required to be consistent with the provisions of the EPBC Act.

There are a number of other Acts affecting the Department's activities or conferring specific powers on the Department. These and other statutory provisions of relevance to the planning area are referred to throughout this plan where relevant. Of most importance to this plan are:

- *Aboriginal Heritage Act 1972*. Under this Act the Department is required to report Aboriginal heritage sites and ensure that sites are protected.
- *Bush Fires Act 1954*. This management plan is required to conform to this Act and satisfy the Fire and Emergency Services Authority that adequate fire protection will be provided. Under section 34(1a)(a) of the Act, management plans require approval from the Authority.
- *Environmental Protection Act 1986*. This Act provides for protection of the environment across the State. The Act provides for the development of Environmental Protection Policies and the assessment of development proposals and planning schemes for potential environmental impacts. Significant development proposals may be referred to the Environmental Protection Authority under the auspices of this Act.
- *Fish Resources Management Act 1994* – governs the management and regulation of recreational and commercial fishing, aquaculture and pearling in the State and is administered by the Department of Fisheries.
- *Heritage of Western Australia Act 1990*. This Act provides for the registration and protection of places of historic interest on land as 'heritage places'.
- *Native Title Act 1993*. This Act requires native title claimants and representative bodies to be advised when a management plan is being prepared or major public works undertaken.
- *Planning and Development Act 2005*. This Act allows the WA Planning Commission (WAPC) to prepare planning strategies for the State. Such planning strategies are prepared to coordinate and promote regional land use planning and land development, and guide Government departments, authorities and local government. The planning area is guided by State Planning Policy No. 2 *Environment and Natural Resources Policy*. Since the planning area includes coastal areas, to guide coastal development, the WA Planning Commission's State Planning Policy No. 2.6 *State Coastal Planning Policy* delineates criteria for assessment of coastal development. The Shire of Shark Bay Town Planning Scheme No. 3 establishes tenure and land use options or zonings for the land the Shire is responsible for.

The CALM Act does not derogate any of the powers of the *Mining Act 1978*, the *Petroleum and Geothermal Energy Resources Act 1967* or any other Act relating to minerals or petroleum, or any Government agreement within the meaning of the *Government Agreements Act 1979*.

Obligations and Agreements

Australia is a participant or signatory to a number of important international and national conservation agreements, some of which affect management of the Shark Bay planning area. They include the following:

World Heritage Convention and State-Commonwealth Agreement

The term World Heritage is applied to sites of outstanding universal natural or cultural significance that are included on the World Heritage List. The Convention concerning the Protection of the World Cultural and Natural Heritage (referred to as the World Heritage Convention) was adopted by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 1972 and came into force in 1975. The aim of the Convention is to promote co-operation among nations to protect natural and cultural heritage which is of such universal value that its conservation is a concern for all people. In 1974, Australia became one of the first countries to ratify the Convention and remains a strong supporter of its aims.

As a signatory to the Convention, nations recognise that they have a duty to ensure the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage situated within their territory. Under the terms of the Convention, a World Heritage List of properties having outstanding universal value has been established. Only parties which are signatories to the Convention (i.e. national governments) may nominate a World Heritage Property. Australia has an international obligation to protect and conserve World Heritage values of properties listed under the World Heritage Convention.

Australia's World Heritage properties are protected under the Commonwealth's EPBC Act. To meet the obligations of the World Heritage Convention, the EPBC Act prohibits actions which have, will have, or are likely to have, a significant impact on the World Heritage values of a declared World Heritage property without the approval of the relevant Commonwealth Minister responsible for the EPBC Act. In addition, the Act provides measures for effective environmental assessment processes and provides for management arrangements for World Heritage to be undertaken in accordance with Australian World Heritage Management Principles. The assessment process may be a Commonwealth process or an accredited State process. Approval will be required from the relevant Commonwealth Minister responsible for the EPBC Act, or from the Western Australian Government in accordance with a management plan accredited by the Commonwealth. Accreditation arrangements will be set out in bilateral agreements between the Commonwealth and Western Australia.

Three of Australia's world heritage properties are within Western Australia; Shark Bay, Purnululu National Park and Ningaloo Coast. Shark Bay was inscribed on the World Heritage List on 13 December 1991 on the basis of its "natural heritage" values and at the time of listing was one of just 11 places globally to satisfy all four of the natural criteria for World Heritage listing.

The Western Australian and Commonwealth Governments signed an Agreement in September 1997 on administrative arrangements for the Shark Bay World Heritage Property. The 1997 State-Commonwealth Agreement provides for on-ground management, operational support and administrative structures of the Property to be carried out by the Western Australian Government in accordance with Australia's obligations under the World Heritage Convention. Further details of the agreement can be found in the *Shark Bay World Heritage Property Strategic Plan* (DEC 2008a).

The Convention on Biological Diversity

Australia signed the 'Convention on Biological Diversity' at the United Nations Conference on Environment and Development (also known as the 'Rio Earth Summit') in 1992. The *National Strategy for the Conservation of Australia's Biological Diversity* was adopted in 1996 as the principal means for co-ordinated implementation of the convention in Australia. Its main goal is to protect biological diversity and maintain ecological processes and systems. To address this goal there has been a number of significant changes to policy and legislation for biodiversity conservation in Australia to strengthen regulatory and institutional mechanisms.

Bonn Convention

Australia is a contracting party to the 'Convention on the Conservation of Migratory Species of Wild Animals' (Bonn Convention), which came into force in 1992. Under this convention countries are expected to protect species that regularly migrate across international boundaries. Migratory species listed under the convention are further protected under the EPBC Act.

The three species of marine turtle recorded in the Shark Bay area—the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*) and the loggerhead turtle (*Caretta caretta*)—are listed under the Bonn Convention. Australia is also a signatory to the Memorandum of Understanding (MOU) on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia created under the Bonn Convention. The MOU covers the Shark Bay area's marine turtles and includes a conservation and management plan which focuses on reducing pressures, conserving critical habitat, exchanging scientific data,

increasing public awareness and participation, promoting regional cooperation, and seeking resources for implementation. National and State level strategies for the conservation of marine turtles have also been produced (see Section 21 – *Native Animals*).

The osprey (*Pandion haliaetus*), also listed under the Bonn Convention, is found in the Shark Bay area.

Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Bird Agreement (ROKAMBA)

Australia's treaties with Japan and China came into force in the 1980s and Korea in 2007 to protect migratory birds in these countries. The treaties provide for bilateral cooperation between the governments involved in order to protect shared species in the East Asian-Australasian Flyway and their habitats. The agreements also give a strong foundation for the conservation efforts of the recently launched East Asian-Australasian Flyway Partnership (Asia-Pacific Shorebird Network 2007). Nearly 80 bird species are listed in these agreements.

Migratory birds listed under these agreements are further protected under the Commonwealth's EPBC Act, which stipulates that all actions that are likely to impact on such species are subject to environmental assessment and approval. This places Australia in a stronger position to meet its international obligations for the protection and management of migratory birds listed under the JAMBA, CAMBA and ROKAMBA agreements.

Twenty-five species of birds found in the planning area are listed in the JAMBA, 21 species are listed in the CAMBA and 24 are listed in the ROKAMBA.

The Australian International Council on Monuments and Sites Charter for the Conservation of Places of Cultural Significance (Burra Charter)

In 1979 the Australia International Council on Monuments and Sites (ICOMOS) adopted a charter for the conservation of places of cultural significance, now known as the *Australia ICOMOS Burra Charter, 1999* (Burra Charter). The charter has been widely adopted as the standard for heritage conservation practice in Australia and applies to all types of places of cultural significance including natural, Indigenous and historic places with cultural values.

Memorandum of Understanding

It is possible for the Department to enter into an MOU or partnerships with Government agencies, local Government authorities, industry groups, or resource users to manage lands. This expands the Department's possible sphere of influence onto private property or land otherwise not under its control.

Responsibility for pre-suppression of fire, fire risk planning, feral animal control and weed control on non-metropolitan, non-townsite unallocated Crown land (UCL) and unmanaged reserves (UMR) was transferred from the Department of Land Administration (now the Land Asset Management Services, DPI) to the Department on 1 July 2003. The Department may take on other on-ground management activities (e.g. management of camping and four wheel drive access) in the future if (i) they are consistent with the Department's core business as a manager of natural lands, and (ii) provided appropriate levels of resources are made available to ensure base levels of management of these lands are achieved. An MOU has been developed between the Department and DPI in relation to the management of the UCL and UMR.

An MOU also has been developed between the Department and DPI in relation to the acquisition and management of former pastoral leases for the conservation reserve system. In the Shark Bay area, such lands have been identified in various previous publications. In the planning area there are:

- lands identified for conservation purposes that have been purchased and/or surrendered; and
- lands for which agreement to purchase has been reached.

An MOU was developed in 2005 between the Department and the Department of Fisheries. This MOU establishes principles of cooperation and integration between the two departments for marine protected areas which include marine conservation reserves under the CALM Act, fish habitat protection areas and other protected areas under the Fish Resources Management Act.

6. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

The Yamatji Marlpa Barna Baba Maaja Aboriginal Corporation is the representative Aboriginal body appointed under the Commonwealth's Native Title Act for the planning area. The role of native title representative Aboriginal bodies is to assist Aboriginal groups or individuals to make applications for native title, help resolve disagreements between groups making applications, and assist groups and individuals by representing them in native title negotiations and proceedings.

There are three active native title claims over the Shark Bay World Heritage Property: the Malgana Shark Bay People's Application (WC98/17), the Nanda People (WG6136/98) and the Gnulli (WC97/28) (Figure 2). Two of these, Malgana and Nanda, are located within the planning area. Malgana and Nanda Native Title Working Groups have been established to deal with claims in the area but no native title determination has been made. The Malgana claim area covers the lands and waters in the immediate vicinity of Shark Bay whilst the Nanda claim area extends from Kalbarri northwards to the shores of Henri Freycinet Harbour.

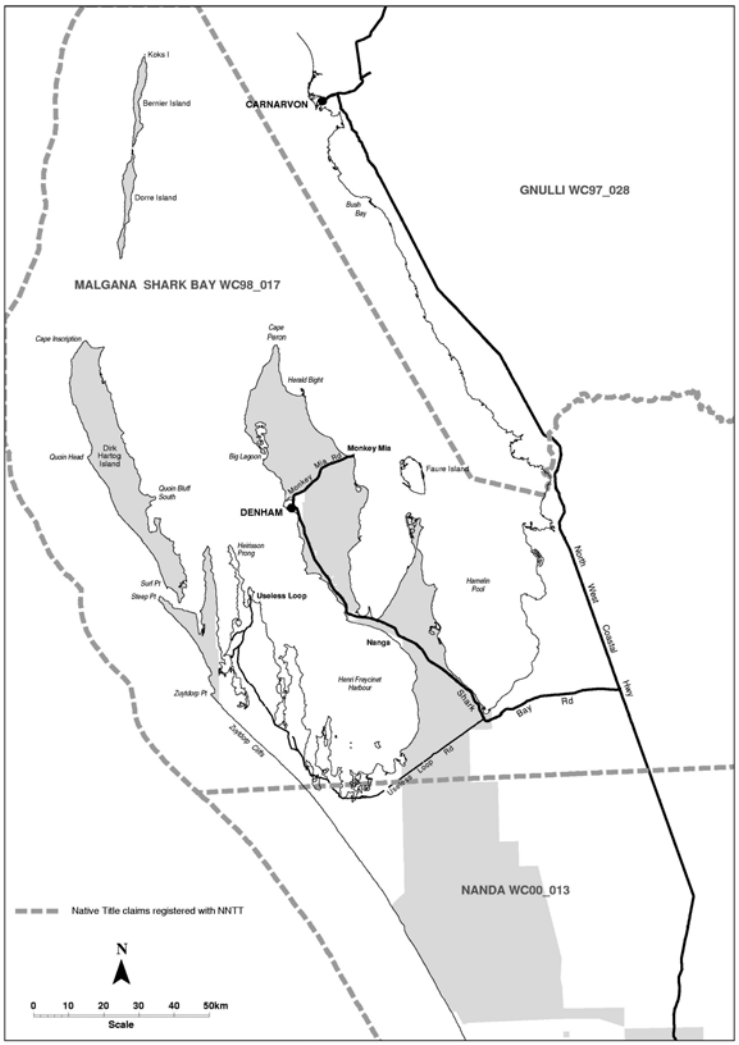


Figure 2: Native Title Claim Areas of the Shark Bay Area

There is a strong interest by Aboriginal people to be involved in the management of conservation estate and to strengthen cultural ties to the land. Working together with Aboriginal people to care for the land will be beneficial to the preservation of natural and cultural heritage, as well as enriching cross-cultural awareness. The Department and the Conservation Commission acknowledge the aspirations of Aboriginal people to obtain native title over their traditional lands and waters under the provisions of the Native Title Act. Both agencies acknowledge that native title rights and interests may be found to exist, except where they have been legally

extinguished under Australian law. This management plan will not have any bearing in relation to Native Title Tribunal processes.

The common law of Australia recognises native title that entitles the Indigenous inhabitants of Australia to their traditional lands. The rights of native title claimants or holders will depend on traditional laws, customs and cultural connection to that land, but may be affected by past dealings in land and existing tenures and uses, such as national park, marine park, private land and pastoral use.

Existing reserves were created within the Shark Bay area under the *Land Act 1933*, *Land Administration Act 1997* or the CALM Act. Reserves vested prior to 23 December 1996 have had native title rights extinguished by the vesting process (Ward High Court decision August 2002). The process for reservation of Crown land which has not been subject to prior extinguishment (such as freehold land) will need to comply with the 'future acts' provisions of the Native Title Act. This will apply to pastoral leases and surrendered pastoral lease areas and the creation of conservation reserves in these areas will not necessarily extinguish native title. The Department's intent is to create the reserves through negotiations with native title claimants to ensure maintenance of native title rights and interests. The Department is currently investigating the development of an Indigenous Land Use Agreement (ILUA) to create reserve additions and retain the rights and interests of native title claimants.

Management of lands and waters by the Department will be within the limits of the reserve's purpose and in accordance with the Native Title Act. The Department's operations on parks and reserves are valid 'future acts' under the Native Title Act and there is the requirement for the Department to inform native title claimants or holders of proposed public works and management plans. The Department's operations on purchased and surrendered pastoral leases will also need to address the 'future acts' provisions process of the Native Title Act. Since native title has been extinguished over homesteads, sheds, buildings, airstrips, constructed dams and constructed stock watering points, and over adjacent land necessary to enjoy the improvements (De Rose High Court decision, June 2005), the Department's operations can proceed on these areas. However, the Department will continue to advise native title claimants or holders of public works and management plan proposals irrespective of whether native title has been extinguished or not. The process of determining native title rights and interests may also determine appropriate areas for Aboriginal occupation.

Irrespective of whether native title has been determined, Aboriginal people still have the right to access for sustenance, maintenance and protection of important places and paintings, and the inheritance of native title rights. The hunting and gathering of food by Aboriginal people is an important part of their culture enabling them to maintain traditional relationships with the land and water, share knowledge and partake in traditional practices (see Section 45 – *Traditional Hunting and Gathering*). Activities which can be undertaken include free movement, hunting, fishing, ceremonies and visiting/protecting important places. Hunting and gathering on nature reserves is not permitted under existing legislation.

Across Western Australia, Demonstration Park Councils have been established at several parks. These councils are partnerships between Indigenous people and the Department for the joint management of specified areas of the conservation estate. Although a Park Council may be considered for the planning area, its establishment and operation is dependent on adequate resourcing and the level of local support. Regardless of whether a Park Council is established, the Department will continue to consult with native title claimants through the relevant representative bodies and working groups on matters of mutual interest.

7. MANAGEMENT PLANNING PROCESS

Planning should be an integral and ongoing part of management for the development of the Shark Bay area and protection of World Heritage, natural and cultural values. The process of producing a management plan is shown in Figure 3.

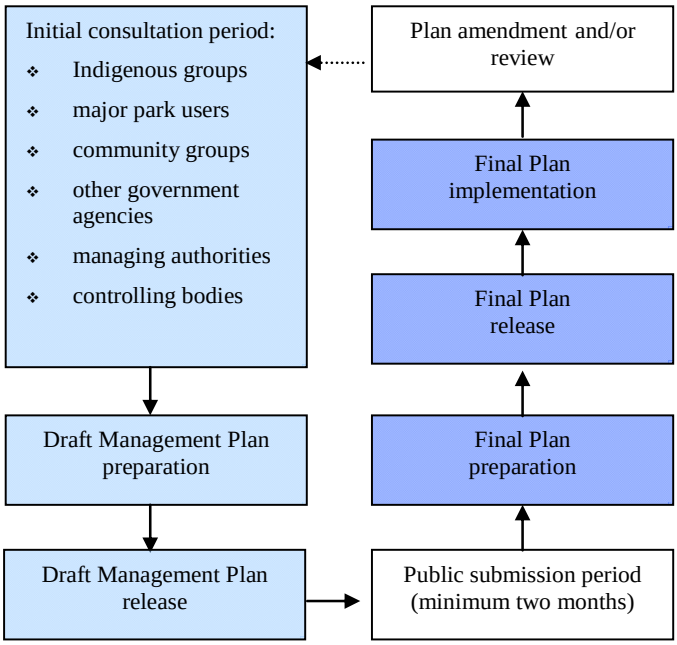


Figure 3: Management Planning Framework[2]

This management plan needs to be consistent with the *Shark Bay World Heritage Property Strategic Plan 2008-2020* (DEC 2008a) in relation to the protection of World Heritage values and to guide day-to-day management of the existing reserves and proposed reserve additions. The Strategic Plan establishes a primary goal that is derived from the World Heritage Convention and is consistent with the management principles listed in the Regulations of the (Commonwealth) EPBC Act. Furthermore, there is a need to consult with the Commonwealth Government during the preparation of plans where the outcomes of the plan may affect World Heritage values, or the integrity of the World Heritage Property. Similarly there is a need to consult with the Commonwealth Government during preparation of plans where the outcomes of the plan may affect National Heritage values such as the Cape Inscription area.

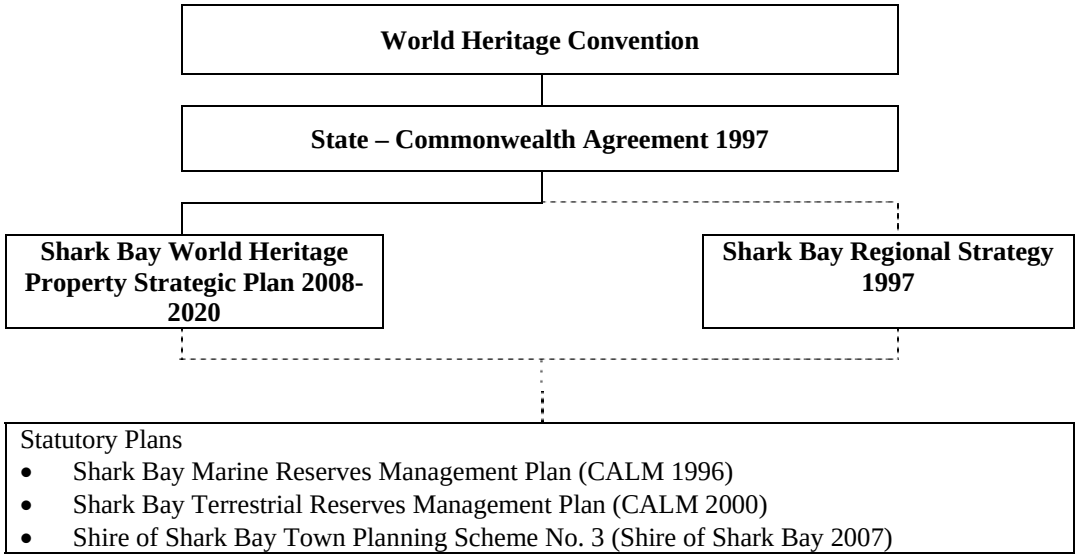


Figure 4: Planning Framework for Shark Bay Area

There are a number of plans covering the Shark Bay area that need to be considered in preparing a new terrestrial reserves management plan. These include strategic plans, statutory plans such as local Government Town Planning Schemes, regional plans, reserve management plans and plans to address specific issues such as site

[2] The framework outline in Figure 3 is not a statutory but rather a policy framework.

development plans, fisheries management, natural resource management, extraction of basic raw materials, tourism and roading. Figure 4 outlines the framework of plans for the Shark Bay area and notes statutory planning documents that have been prepared which address the protection and management of natural and cultural values in the Shark Bay area. In addition, a number of regional planning documents dealing with ecotourism, aquaculture, fish and economic development have been produced.

8. PUBLIC PARTICIPATION

The management plan has been developed in consultation with key stakeholders, planning area users and other interested parties in the following ways:

- distributing 'Have Your Say' brochures to encourage individuals and organisations to register their interest in the planning process and identify issues to be considered during the development of the draft;
- distributing an 'Issues Paper' to stimulate discussion, to inform and to assist the public in participating in the management planning process;
- forming the Shark Bay Terrestrial Reserves Community Advisory Committee which met regularly to discuss management issues and provide input during development of the plan;
- discussing components of the draft management plan with members of the World Heritage Property Community Consultative and Scientific Advisory Committees;
- holding meetings with key stakeholders from Denham and Carnarvon when preparing the draft management plan and after the draft plan was formally released for public comment;
- providing public displays and collecting information from the community;
- providing regular updates to keep interested parties informed of developments in the planning process (i.e. *The Planning Diary* newsletter);
- providing regular media releases at key stages of the planning project;
- consulting with government agencies, including the Gascoyne Development Commission (GDC), Tourism WA, Department of Indigenous Affairs (DIA), DPI, and former Department of Industry and Resources (DoIR) (now Department of Mines and Petroleum, DMP);
- inviting public submissions through State and local newspapers after the draft management plan was released for public comment; and
- preparing an Analysis of Public Submissions received on the draft management plan.

10. LAND TENURE AND CLASSIFICATION

Land tenure is used to describe the form of right or title to land and is usually designated private (freehold) land or Crown land. In Western Australia, the security of tenure of Crown reserves created under the *Land Administration Act 1997* varies, depending upon whether the reserve is 'class A' or 'other than class A' (unclassified). This system therefore determines the degree of difficulty involved in changing the tenure of Crown land. Under the previous *Land Act 1933*, reserves were classified A, B or C. Changes to a class A reserve requires the agreement of both Houses of Parliament. Changes to an unclassified reserve require approval at Ministerial level.

Crown lands managed by the Department fall into three broad categories:

- Crown reserves vested in the Conservation Commission, Marine Parks and Reserves Authority (MPRA) or Conservation and Land Management Executive Body (formerly the Executive Director Body Corporate);
- State forests and timber reserves created under the CALM Act which are vested in the Conservation Commission; and,
- unmanaged Crown reserves and UCL that fall outside the Perth Metropolitan area and townsites.

Management by the Department is carried out according to Government policies and as specified in management plans submitted by the controlling bodies and approved by the Minister for Environment.

Land Categories

Section 5(1) of the CALM Act lists ten categories of land to which the Act applies. Categories of land within the planning area vested in the Conservation Commission and managed by the Department are listed in Table 1.

Table 1: Land Category, Purpose, Class and Management Objective

Land Category	Purpose	Class	Management Objective
nature reserve	Conservation of Flora and/or Fauna under the Land Administration Act and/or CALM Act.	Either class A or other than class A (unclassified)	To maintain and restore the natural environment, and to protect, care for, and promote the study of, indigenous flora and fauna, and to preserve any feature of archaeological, historic or scientific interest. Some low impact recreation that does not harm natural ecosystems is allowed.
national park	national park under the Land Administration Act and/or CALM Act.	Mostly class A	To fulfil so much of the demand for recreation as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna, and the preservation of any features of archaeological, historic or scientific interest. National parks have national significance for scenic, cultural or biological values, and can accommodate recreation that is consistent with maintaining these values.
conservation park	conservation park under the Land Administration Act and/or CALM Act.	Either class A or other than class A (unclassified)	Managed identically to national parks but mostly have regional or local, rather than national, significance.
Calm Act section 5(1)(h) land	Various		Reserves vested in or placed under the care, control and management of the Conservation Commission and managed for a variety of purposes including recreation and conservation. The reserves defined in section 5(1)(h) are created under the Land Administration Act.

11. EXISTING AND PROPOSED TENURE

The status of existing terrestrial reserves and proposed reserve additions is described below.

Existing Reserves

Francois Peron National Park

Francois Peron National Park (Reserve 42471) is a 'class A' reserve of 52,586.8 hectares. It was gazetted on 8 January 1993 for the purpose of 'national park'. The Park was created as a result of the State Government's purchase of Peron Station (PL No. 3114/761) in 1990. The Park extends to the high water mark (HWM) and the waters adjoining the Park form part of the Shark Bay Marine Park.

An area of UCL exists at Guichenault Point and it is proposed to be incorporated into the national park. Two gypsum mining leases over UCL are located in the northern part of the national park and it is proposed to incorporate them into the Park. See *Proposed Reserves* this section and Table 3 for more details.

Reserve 29432, a disused aircraft landing ground on the Park's southern boundary along the Monkey Mia Road, was added to the Park on 25 May 1999. The airstrip was constructed in a birrida (salt pan) which has since been rehabilitated.

A small reserve for a navigation beacon exists near Cape Peron (Reserve No. 37742).

Dirk Hartog Island National Park

Dirk Hartog Island National Park (Reserve 50325) is a class A reserve of 62,928.5 hectares. It was created on 29 October 2009 for the purpose of 'national park'. The park was created as a result of the State Government's

purchase of Dirk Hartog Island pastoral lease (PL No. 3114/400) in 2009. The proposed name is subject to endorsement by the Department's nomenclature committee and approval of the State Geographic Names Committee.

The park incorporates the 40 metre strip of UCL between the former pastoral lease boundary and high water mark (HWM). On the eastern, northern and southern sides of the island, it adjoins the Shark Bay Marine Park at HWM. On the western side of the island adjacent to the Zuytdorp Cliffs, the park extends to low water mark (LWM). In the event that the Shark Bay Marine Park is extended to include the western part of the coastline, the boundary of the terrestrial reserve will be changed from LWM to HWM and the marine park boundary established to HWM.

As part of the settlement, two existing freehold lots (Edel Location 20 [16 hectares]) and North Location 63 [40.47 hectares]) were relinquished by the pastoral lessee and incorporated into the national park. Three new freehold lots were established, two (Lot 304 [about 11.3 hectares] and Lot 305 [about 4.6 hectares]) at Sunday Island Bay and one (Lot 303 about 17.3 hectares) adjoining the existing homestead freehold lot (Location 62 [about 42 hectares]). The existing homestead lot extends to LWM. Also as part of the settlement, Lot 300 was created for a lease over an area adjacent to Cape Levillain (about 2.5 hectares) for the purpose of ecotourism.

Also during the settlement and as part of the Indigenous Land use Agreement, a reserve for the 'use and benefit of Aboriginal people' (Lot 351 [about 5 hectares]) was created near Tumbledown Point.

Reserve 14918 in the Cape Inscription area is an 'unclassified' reserve of 298 hectares. Unlike the remainder of Dirk Hartog Island, this reserve extends to HWM and there is no 40 metre strip of UCL between HWM and pastoral lease boundaries. It has been agreed between the Department, the Shire of Shark Bay and the Department of Regional Development and Lands to now include this reserve within the national park. This is consistent with the *Shark Bay Strategic Plan* (WA Planning Commission 1997).

Reserve 12715 is a 'class A' reserve of 0.48 hectares and was originally gazetted on 10 June 1910 for the purpose of 'Government Requirements Protection of Inscription Posts'. It is the location of the inscription posts from Hartog's and Vlamingh's landing.

Reserve 45498 is a 'class A' reserve of 0.07 hectares and was gazetted in December 2000 for the purpose of 'Navigation, Communication, Meteorology and Survey'. The reserve contains the lighthouse.

Reserve 46663 is an 'unclassified' reserve of 1.55 hectares. It is vested with the Shire of Shark Bay and was gazetted in November 2001 for the purpose of 'heritage precinct'. The reserve is immediately south of the lighthouse and west of the inscription posts and incorporates the lighthouse keeper's quarters.

Parts of Dirk Hartog Island contain important biological areas such as breeding areas for waterbirds and turtles. If required, these areas may be declared 'limited access areas' under section 62 of the CALM Act which allows for access only when permission is given (see Section 32 – *Visitor Access – Special Access*).

Shell Beach Conservation Park

Shell Beach Conservation Park (Reserve 42443) is an unclassified reserve of 517.8 hectares. It was gazetted on 8 January 1993 for the purpose of 'conservation park'. The Park was created as a result of the State Government's purchase of Peron Station (PL No. 3114/761) in 1990. The Park extends to the HWM and the adjoining waters form part of the Shark Bay Marine Park. The name is unofficial.

The reserve's fauna and landscape values warrant upgrading the reserve from unclassified to class A. The name will be made official.

Adjoining Shell Beach Conservation Park is a quarry for the mining of shell grit (see *Nanga* this section).

Zuytdorp Nature Reserve

Zuytdorp Nature Reserve (Reserve 34771) is an unclassified reserve of 58,850 hectares. It was gazetted on 13 December 1991 for the purpose of 'conservation of flora and fauna' from the amalgamation of two reserves previously known as the Cooloomia Nature Reserve (originally gazetted in 1979) and the unvested Zuytdorp National Park (originally gazetted in 1977).

The Reserve's flora, vegetation, landscape and cultural heritage values warrant upgrading of the Reserve to class A.

The *Shark Bay Regional Strategy* (1997) proposed that the surrounding portions of Nanga and Tamala pastoral leases be added to Zuytdorp Nature Reserve as nature reserve. However, a review of former pastoral leases recommended in 2007 that the former Nanga pastoral lease become a conservation park. Therefore this management plan recommends that the former Nanga area become conservation park and the former Tamala area become nature reserve and incorporated into Zuytdorp Nature Reserve. The portion of Murchison House north of the State Barrier Fence also can be added to Zuytdorp Nature reserve. These tenure proposals will contribute to greater representation in conservation reserves for two of Shark Bay's World Heritage values—the botanical transition zone and the spectacular Zuytdorp Cliffs. The area encompassing these combined portions of land has high wilderness quality (see Section 16 – *Wilderness*).

Bernier and Dorre Islands Nature Reserve and Koks Island Nature Reserve

Bernier and Dorre Islands Nature Reserve (Reserve 24869) is a 'class A' reserve of 9,719.8 hectares. Bernier and Dorre Islands were vested in the Fauna Protection Advisory Committee for the purpose of 'conservation of fauna' on 6 December 1957. The purpose was amended in 1980 to 'conservation of flora and fauna'. With the proclamation of the CALM Act in 1984, vesting the reserve was vested in the National Parks and Nature Conservation Authority and then in 2000 in the Conservation Commission. This reserve is declared to the LWM.

In 1907 Dorre Island was declared a reserve for native game under the *Game Act 1892* and Bernier Island was declared for the same purpose in 1919. The Game Act protected fauna from wanton destruction but not from habitat interference.

Currently the nature reserve boundary extends to LWM. A proposal to extend the Shark Bay Marine Park to include waters adjacent to the islands is being considered. In the event that the Shark Bay Marine Park is increased to include the coastline of the islands, the boundary of the terrestrial reserve will be changed from LWM to HWM and the marine park boundary established to HWM.

In 1970 Bernier Island was declared a "limited access area" which allows for day use but not overnight use, and Dorre Island was gazetted a "prohibited area" which allows for access only when permission is given. Section 32, *Visitor Access – Special Access*, recommends that this arrangement continue.

Two lighthouse reserves are enclaves in the Nature Reserve. These reserves were originally declared in 1981, and in 1994 were enlarged subsequent to a survey of existing improvements on the site.

Koks Island Nature Reserve (Reserve 33901) is a 'class A' reserve of 2.78 hectares. It was gazetted on 5 March 1976 for the purpose of 'conservation of flora and fauna'. The name is unofficial.

Due to the close proximity of Koks Island to Bernier and Dorre Islands and all having the same tenure and purpose, it is proposed that the three islands should be combined and renamed "Bernier, Dorre and Koks Islands Nature Reserve".

Proposed Shark Bay Islands Nature Reserve

There are over 30 or so small islands, islets and rocks across Shark Bay and all have natural values of significance. Only 15 of these islands are nature reserves and named (see list below).

The remaining islands (with the exception of Faure Island which is leased for pastoral purposes but used also for fauna conservation) are UCL, unnamed and most are little more than rock outcrops that provide important seabird habitats and possess significant scenic qualities (see *Proposed Reserve*s this section).

The existing reserved island nature reserves are:

- Fifteen 'class A' islands (Reserve 26004) gazetted in 2009 for the purpose of 'conservation of flora and fauna' and consisting of the unnamed Charlie and Friday islands, and the formally named (on 4 May 1979) Freycinet, Double, Sunday, Pelican, White, North, Salutation, Baudin, Egg, Three Bays, Wilds, Mary Anne and South Guano islands for a total area of 207.3 hectares.

The previous purpose of Reserve 26004 was a legacy of the islands' past use for guano mining. In 2007, the purpose of Reserve 26004 was amended to 'conservation of flora and fauna'.

The tenure and purpose of the island nature reserves are disjointed and the island names are often confused. For simplicity, it is proposed that all of the island nature reserves (other than Bernier, Dorre Islands Nature Reserve and Koks Island Nature Reserve) should have common tenure and be declared as a single reserve to be known as the 'Shark Bay Islands Nature Reserve'. Unnamed islands should be officially named after consultation with the local community (see *Proposed Reserves* this section).

The *Shark Bay Regional Strategy* (WA Planning Commission 1997) proposes that all of Shark Bay's unvested islands be vested in the Conservation Commission as nature reserves. Other Government approved plans also support this and recommend formally naming the islands.

Under Section 62 of the CALM Act, lands and waters may be classified as 'prohibited areas', 'limited access areas' or any other classification to prescribe conditions of use for the protection of key values. Several of the islands may warrant zoning or other access restrictions to protect nesting habitats or other natural values. An assessment of all islands should be conducted to determine appropriate land classification (see Section 32 – *Visitor Access – Special Access*).

Table 2: Proposed Tenure Changes to Existing Reserves

Reserve/ Tenure	Current Purpose	Current Vesting	Current Class	Area (ha)	Proposed Changes
Francois Peron National Park	National park	Conservation Commission	Class A	52,586.8	No change required
Shell Beach Conservation Park (Reserve 42443)	Conservation Park	Conservation Commission	other than class A	517.8	Amend reserve classification to class A. Make name official.
Dirk Hartog Island National Park (Reserve 50325)	National Park	Conservation Commission	class A	62,928.5	Make name official If Shark Bay Marine Park is extended to include waters along western coastline of the island, change the boundary of the proposed terrestrial reserve from LWM to HWM and ensure marine park boundary is to HWM. Reserve 14918 to be incorporated into Dirk Hartog Island National Park
Zuytdorp Nature Reserve (Reserve 34771)	Conservation of flora and fauna	Conservation Commission	other than class A	58,850	Amend reserve classification to class A.
Bernier & Dorre Islands Nature Reserve (Reserve 24869) Koks Island Nature Reserve (Reserve 33901)	Conservation of flora and fauna	Conservation Commission	class A	9,722.58	Incorporate Koks island into Bernier and Dorre Islands Nature Reserve. Change name to "Bernier, Dorre and Koks Islands Nature Reserve". If Shark Bay Marine Park is extended to include waters surrounding the islands, change terrestrial reserves boundary from LWM to HWM and ensure marine park boundary is to HWM.
Shark Bay Islands nature reserves: (Freycinet, Double, Sunday, Pelican, White, Salutation,	Conservation of Flora and Fauna	Conservation Commission	class A	207.28	Incorporate Freycinet, Double, Sunday, Pelican, White, Salutation, Baudin, Egg, Three Bays, Wilds, Mary Anne, North Guano, South

Reserve/ Tenure	Current Purpose	Current Vesting	Current Class	Area (ha)	Proposed Changes
Baudin, Egg, Three Bays, Wilds, Mary Anne, North Guano, South Guano, Charlie and Friday – Reserve 26004)					Guano, Charlie and Friday islands into the proposed "Shark Bay Islands Nature Reserve" as a single class A nature reserve vested with the Conservation Commission for the purpose of 'Conservation of Flora and Fauna'.
					Formally name Friday and Charlie islands.
Total Area of Existing Conservation Reserves				184,753.7	

Proposed Reserves

Any conservation reserve creation is a matter for Government consideration and determination on a case by case basis. A final management plan only governs CALM Act lands and cannot be binding in respect of proposed further reservations. The subsequent final plan requires Minister approval.

Proposed tenure changes are summarised in Table 3. All lands are proposed to be vested in the Conservation Commission. For consistency and clarity of management, the long term intent is to have marine conservation reserves extend to HWM. This will involve some changes to the proposed terrestrial reserves in the medium term if the marine conservation reserves are expanded in Shark Bay.

The acquisition of these lands for conservation estate may be briefly justified on the basis of:

- they represent additions to IBRA regions and subregions and the addition of vegetation communities not currently represented in the conservation estate (see Section 15 *Biogeography*);
- they were identified in previous State Government reports (see Section 1 – *Brief Overview*)
- the key values of the land including world heritage, natural and in some cases cultural and recreation (see Section 4 – *Key Values*); and
- they provide an opportunity to manage threats to values such as introduced animals (see Section 24 – *Introduced and Other Problem Animals*), soil erosion (see Section 18 – *Geology, Geomorphology and Soils*), landscape quality (see Section 37 – *Visual Landscape*), uncontrolled access (see Section 32 – *Visitor Access*) and uncontrolled recreation activities (see Section 33 – *Recreation Activities and Use*).

Given these values, the Department and the Conservation Commission believes the proposed reserve additions should primarily be set aside as class 'A' reserves for the purpose listed in Table 3. However, the land category and class needs to be consistent with any State Government direction and therefore some areas will be set aside as unclassified reserves for the purpose of conservation park.

Before a reserve can be created, all impediments need to be removed. In the interim, areas of UCL identified for inclusion in the conservation estate will be managed under the MOU between the Department and DPI for the acquisition and management of pastoral leases acquired for addition to the conservation estate.

Unallocated Crown Land & Crown Reserves

Usually a 40 metre strip of UCL separates pastoral leases from the adjoining marine waters. Throughout the planning area where proposed terrestrial reserves are located, this 40 metre strip of UCL will be included in the terrestrial reserve.

An area of UCL exists at Guichenault Point in Francois Peron National Park. The Point functions as part of the national park and wildlife and recreation programs are proposed in this area. Therefore the UCL should be reserved as part of the national park.

Two gypsum mining leases over UCL (M09/7 and M09/8) were previously granted to Agnew Clough Ltd and Australian Mutual Provident Society in 1984 and are enclaves in Francois Peron National Park. These leases were relinquished on 27 August 2002 and the administrative process to incorporate the leases into the national park has commenced. This action is consistent with the *Shark Bay Regional Strategy* (WA Planning Commission 1997).

There are three reserves associated with shell grit mining in the area between Shell Beach Conservation Park and Nanga. Reserve 41076 along the shoreline to the east of Shell Beach is an 'other than class A' reserve of 81.48 hectares. It is vested with the Shire of Shark Bay for the purpose of 'Quarry - Shell Grit'. Reserve G09/3 (1.95 hectares) is a gazetted access way to Reserve 41076 from the Shark Bay Road and storage area. Reserve M09/68 (6.07 hectares) is a mining tenement to the north of Reserve 41076. Once the shell grit mine resources are depleted or the mine lease expires, it is proposed to enter into negotiations with the Shire of Shark Bay to incorporate Reserve 41076 and with the mining lease holder and DMP to incorporate reserves G09/3 and M09/68, into the adjoining proposed 'Nanga Conservation Park' (see Map 2).

There are about eighteen islands across Shark Bay currently unreserved and unnamed. These include Smith Island North, Smith Island South, Wilds Islet, Wilds North Islet, Wilds South Islet, Wilds Southwest Islet, Depuch Loop Islet, Charlie Islet, Kangaroo Island, Kangaroo Islet, Kangaroo South Islet, Kangaroo North Islet, Briggs Island, Lebrefre Island, Ransonnet Rock, Meade Island, Wilson Islet and Eagle Island. The names of these islands, islets and rocks are only informal and a formal process of naming the islands is required. This management plan proposes that these islands, islets and rocks be incorporated into the proposed 'Shark Bay Islands Nature Reserve' as a single class A nature reserve for the purpose of 'Conservation of Flora and Fauna' with the boundary set at HWM.

Nanga

The former Nanga pastoral lease covering about 176,407 hectares was purchased on 12 December 2000. It is currently UCL and managed under an MOU between the Department and DPI established for the acquisition and management of pastoral leases for conservation.

The *Shark Bay Regional Strategy* (WA Planning Commission 1997) identified the most northern part around Petit Point and the southern part of the lease to be set aside as nature reserve with the southern part to be incorporated into Zuytdorp Nature Reserve. When that document was prepared, the northern or central part of the lease was to remain pastoral lease. However, during negotiations for purchase, the pastoral lease-holder would only sell the property only as a whole. The southern part of the pastoral lease has never been developed for sheep production. However, a review of former pastoral leases recommended in 2007 that the former Nanga pastoral lease become a conservation park (see Map 2).

In the long term and perhaps beyond the life of this management plan, it is proposed that:

- the northern tip of the Nanga Peninsula in the Petit Point area be set as a class A reserve for the purpose of 'conservation park' and named 'Petit Point Conservation Park';
- the area north of the Shark Bay Road, but south of Petit Point be set aside as an unclassified reserve for the purpose of 'conservation park' and named 'Nanga Conservation Park';
- the area south of the Shark Bay townsite and extending to just south of the Nanga Resort area, be set aside as a class A reserve for the purpose of 'conservation park' and incorporated into the proposed 'South Peron (yet to be named) Conservation Park'; and
- the area south of the Shark Bay and Useless Loop Road be set aside as an unclassified reserve for the purpose of 'conservation park' and named 'Nanga Conservation Park'.

The use of the proposed names is subject to endorsement by the Department's nomenclature committee and approval of the State Geographic Names Committee.

Although the botanical importance, the landscape features and natural values of the Nanga area warrant this area to be a 'class A' reserve, a review of former pastoral leases in 2007 has approved the establishment of this former pastoral lease as an unclassified reserve due to mineral resource potential.

There is a 40 metre strip of UCL between HWM and the former pastoral lease boundary. Currently the Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve are gazetted to HWM across the whole Shark Bay area. Therefore, where required, the UCL strip will be incorporated into the proposed 'Nanga Conservation Park' (see Map 2).

Gravel resource issues along the Useless Loop Road are being addressed by the Department, Shire of Shark Bay, Main Roads WA and DMP. Several potential gravel areas have been identified (see Map 2) and will be set aside as reserves before the conservation park is created. Additional mineral leases for the provision of construction material will be excluded from the proposed 'Nanga Conservation Park' (see Section 47 *Basic Raw Materials*).

There are Exploration Licences (applied for and pending) over the southern part of Nanga (see Section 46 – *Mineral and Petroleum Exploration and Development* and Figure 4).

Reserve 43387 adjacent to the Useless Loop Road is an 'other than class A' reserve of 2.25 hectares. It was vested with Telstra Corporation for the purpose of 'Repeater Station Site' on 16 April 1996.

There is a bush airstrip located near Nanga Resort and a permit issued for its use and maintenance. It is proposed that a formal lease arrangement be entered into for its use and maintenance.

Part Tamala

The southern part of Tamala station (about 56,343 hectares) was purchased and surrendered on 4 April 2006. The area was previously identified for exclusion from the lease when it expires in 2015. It is currently UCL and managed under an MOU between the Department and DPI established for the acquisition and management of pastoral leases for conservation.

The *Shark Bay Regional Strategy* (WA Planning Commission 1997) identified the southern part of the lease to be set aside as nature reserve and be incorporated into the adjacent Zuytdorp Nature Reserve.

Consistent with a review of former pastoral leases recommended in 2007, this management plan proposes that the area acquired from the former Tamala pastoral lease be set aside as a nature reserve for the purpose of 'conservation of flora and fauna' and incorporated into an expanded Zuytdorp Nature Reserve. The botanical importance, the landscape features and natural values of the land warrant this area to be a 'class A' reserve.

There has been no pastoral development in this area in the past. Old stock routes traverse the area and the remnants of old wells and soaks are present. However, vehicle tracks in this area are overgrown and have become un-trafficable.

Along the west coast, adjacent to the Zuytdorp Cliffs, there is a 40 metre strip of UCL between HWM and the former pastoral lease boundary. This strip will be incorporated into the proposed expanded Zuytdorp Nature Reserve. Where the area adjoins the coast, the boundary of the proposed conservation reserve is to extend to LWM. In the event that the Shark Bay Marine Park is increased to include this part of the coastline, the boundary of the terrestrial reserve will be changed from LWM to HWM and the marine park boundary established at HWM.

There are Exploration Licences (applied for and pending) over the part of Tamala proposed for reservation (see Section 46 – *Mineral and Petroleum Exploration and Development*).

Part Murchison House

The part of Murchison House station north of the State Barrier Fence was purchased and surrendered on 2 August 2005. The area was previously identified for exclusion from the lease when it expires in 2015. It is currently UCL and managed under an MOU between the Department and DPI established for the acquisition and management of pastoral leases for conservation.

The *Shark Bay Terrestrial Reserves Management Plan* (CALM 2000) did not address this area because it is outside the boundaries of the World Heritage Property.

Consistent with a review of former pastoral leases recommended in 2007, this management plan proposes that the area acquired of the former Murchison House pastoral lease be set aside as a nature reserve for the purpose of 'conservation of flora and fauna' and incorporated into an expanded Zuytdorp Nature Reserve. The botanical importance and landscape features and natural values of the land warrant this area to be a 'class A' reserve.

Along the west coast adjacent to the Zuytdorp Cliffs there is a 40 metre strip of UCL between HWM and the former pastoral lease boundary. This strip will be incorporated into the proposed expanded Zuytdorp Nature Reserve. Where the area adjoins the coast, the boundary of the proposed conservation reserve is to extend to LWM. In the event that the Shark Bay Marine Park is increased to include this part of the coastline, the boundary of the terrestrial reserve will be changed from LWM to HWM and the marine park boundary established to HWM.

Access to the *Zuytdorp* shipwreck is along the State Barrier Fence and through this former part of Murchison House station. These areas may be classified as some form of special access under section 62 of the CALM Act.

Access to the area will continue to be subject to conditions issued by the Department of Agriculture and Food (for along the State Barrier Fence), Western Australian Museum (for the historic shipwreck) and the Department.

Part Carrarang

The western part of Carrarang pastoral lease (about 18,772 hectares) was surrendered on 7 January 2008 as part of the 2015 exclusion for public purpose process.

The *Shark Bay Regional Strategy* (WA Planning Commission 1997) proposed that the Bellefin Prong, Steep Point and False Entrance areas become national park. The Strategy also recommended that Heirisson Prong north of the town of Useless Loop be included in this surrender and set aside as a national park or nature reserve. Given the level of recreation occurring in the Heirisson Prong and Steep Point areas, this plan recommends that national park is the more appropriate tenure for both areas.

This management plan proposes that all of the area of Carrarang pastoral lease identified for acquisition and surrender be set aside as 'class A' reserve for the purpose of 'national park' and named 'Edel Land National Park'. The proposed name is subject to endorsement by the Department's nomenclature committee and approval of the State Geographic Names Committee. The botanical importance, landscape features and natural values of the land warrant it to be a 'class A' reserve.

There is a 40 metre strip of UCL between HWM and the pastoral lease boundary. Where the strip adjoins the Shark Bay Marine Park (i.e. the Steep Point to Blind Inlet area, Bellefin Prong and northern part of Heirisson Prong), it will be incorporated into the proposed 'Edel Land National Park'. Along the western coast adjacent to the Zuytdorp Cliffs, the UCL strip will be incorporated into the proposed 'Edel Land National Park' and the boundary extended to LWM. In the event that the Shark Bay Marine Park is increased to include the western part of the coastline, the boundary of the terrestrial reserve will be changed from LWM to HWM and the marine park boundary established to HWM.

Access to Heirisson Prong is through the mining town of Useless Loop. Native fauna reintroductions have occurred on Heirisson Prong, which has had restricted access since a predator proof fence was constructed. Access to the area will require the permission of the mine operator and the Department.

A Telstra tower services the 'Ranger's residence and residential buildings constructed by the Clough family. The tower is not within its own reserve.

The Steep Point Lighthouse, Reserve 26400, is an 'other than class A', 5(1)(h) reserve of 0.1 hectares. It was vested with the Conservation Commission on 23 January 2001 for the purpose of 'Conservation, Navigation, Communication, Meteorology and Survey'. It was originally gazetted in 27 July 1962 for the purpose of 'Lighthouse' and has had various vesting bodies since then. It is unnamed.

The newly constructed residence at Shelter Bay, known as the 'Shelter Bay buildings' was constructed by the previous Carrarang pastoral station lease holders. The buildings are to be retained by them under a lease arrangement with, in the short term the DPI. Eventually and once the reserve has been created, it is proposed the area become a section 5(1)(h) reserve and leased under the CALM Act.

South Peron

The tenure and land use of the 53,408 hectare South Peron area is proposed to be divided in various ways.

The *Shark Bay Regional Strategy* (WA Planning Commission 1997) proposed that the entire South Peron area become timber reserve and set aside for multiple use. Given that sandalwood production is unlikely, timber reserve is no longer an appropriate tenure.

This management plan proposes that South Peron be set aside as 'conservation park' and an appropriate name identified. Any proposed name is subject to endorsement by the Department's nomenclature committee and approval of the State Geographic Names Committee.

The botanical importance, landscape features and natural values of South Peron warrant this area to be a 'class A' reserve. However, in the interim it may be necessary that the entire area be set aside as an unclassified reserve while gravel resource issues are addressed between the Department, Shire of Shark Bay, Main Roads WA and DMP. Several potential gravel areas have been identified (see Map 2) and will be set aside as reserves before the conservation park is created. Additional mineral leases for the provision of construction material will

be excluded from the proposed 'South Peron (yet to be named) Conservation Park' (see Section 47 *Basic Raw Materials*).

There is a 40 metre strip of UCL between the HWM and former pastoral lease boundary. Along both the western and eastern coast where it adjoins the Shark Bay Marine Park, this strip should be incorporated into the proposed 'South Peron (yet to be named) Conservation Park'.

The proposed boundary of the northern part of South Peron surrounding the town of Denham is to align with 'Central West Track' on the eastern boundary to the junction with 'New Bore Track' and then in a line to the junction of the 26th parallel and Hamelin-Denham Road then west to the sea on the southern side of the Ocean Park lease (see Map 2). The future vesting and purpose of the area adjacent to the town of Denham will be determined through negotiations between the Shire of Shark Bay and DPI but in the interim will be retained as UCL. The Ocean Park lease is to be excluded from the proposed 'South Peron (yet to be named) Conservation Park'.

Edel Location 81, near Eagle Bluff, was set aside as an airstrip for the town of Denham but never developed. The land will be incorporated into the proposed 'South Peron (yet to be named) Conservation Park'.

Reserve 44988 (136.7 hectares) is vested with the Shire of Shark Bay and used as a quarry. This is to be retained by the Shire. Once the materials are depleted or the mine lease expires, it is proposed to enter into negotiations with the Shire of Shark Bay to incorporate Reserve 44988 into the adjoining proposed 'South Peron (yet to be named) Conservation Park' (see Map 2).

Zuytdorp Area

The area incorporating Zuytdorp Nature Reserve, southern part of Nanga, southern part of Tamala and the northern part of Murchison House has been assessed for wilderness potential and rated as meeting the criteria. However no wilderness area will be gazetted during the life of this plan (see Section 16 – *Wilderness*).

Table 3: Proposed Tenure Changes to Proposed Reserves

Tenure	Proposed Purpose	Proposed Class	Area (ha)	Proposed Changes
Surrendered pastoral lease				
Ex Nanga pastoral lease	Conservation park	Other than class A	176,407	Whole of former Nanga pastoral lease to be conservation park. The 40m strip of UCL between HWM and the boundary of the former pastoral lease to be incorporated into the proposed conservation park (see Map 2).
Ex Part Tamala pastoral lease	Conservation of flora and fauna	class A	56,343	Area to be nature reserve to LWM and incorporated in an expanded 'Zuytdorp Nature Reserve'. The 40m strip of UCL between HWM and the boundary of the former pastoral lease to be incorporated into the proposed nature reserve (see Map 2). If Shark Bay Marine Park is extended to include waters along western coastline, change the boundary of the proposed terrestrial reserve from LWM to HWM and ensure marine park boundary is to HWM.
Ex Part Murchison House pastoral lease	Conservation of flora and fauna	class A	37,578	Area to be nature reserve to LWM and incorporated in an expanded 'Zuytdorp Nature Reserve'. The 40m strip of UCL between HWM and the boundary of the former pastoral lease to be incorporated into the proposed nature reserve (see Map 2). If Shark Bay Marine Park is extended to include waters along western coastline, change the boundary of the proposed terrestrial reserve from LWM to HWM and ensure marine park boundary

Tenure	Proposed Purpose	Proposed Class	Area (ha)	Proposed Changes
				is to HWM.
Ex Part Carrarang pastoral lease	National park	class A	18,772	Carrarang area adjacent to Shark Bay Marine Park including Heirisson Prong, Bellefin Prong, Shelter Bay and Steep Point to be national park to HWM and named 'Edel Land National Park'. The 40m strip of UCL between HWM and the boundary of the former pastoral lease to be incorporated into the proposed national park (see Map 2).
				Carrarang area adjacent to the western coastline between Steep Point and False Entrance to be national park to LWM and named 'Edel Land National Park'. The 40m strip of UCL between HWM and the boundary of the former pastoral lease to be incorporated into the proposed national park (see Map 2). If Shark Bay Marine Park is extended to include waters along western coastline, change the boundary of the proposed terrestrial reserve from LWM to HWM and ensure marine park boundary is to HWM.
	5(1)(h) reserve		About 3 ha	Create a section 5(1)(h) reserve over the area encompassing the Shelter Bay Clough residence.
Unallocated Crown land				
South Peron	Conservation park	class A	~50,000	Excluding an area surrounding the town of Denham, South Peron to be a conservation park to HWM and become 'South Peron' (yet to be named) Conservation Park. The 40m strip of UCL between HWM and the boundary of the former pastoral lease to be incorporated into the proposed national park (see Map 2).
			94.5	Edel Location 81 (former airstrip) to be incorporated into the proposed conservation park.
Guichenault Point	National park	class A		Incorporate into Francois Peron National Park
Former mining tenements M09/7 and M09/8	National park	class A	348.9	Incorporate into Francois Peron National Park
Mining tenements G09/3 & M09/68	Conservation park	class A	8.02	Subject to the expiry of shell grit mining and negotiations with lease holders, incorporate into the proposed 'Nanga Conservation Park'
Un-named islands				Identify and, after consultation with the community, name all islands, islets and rocks. Vest all un-named islands, islets and rocks with the Conservation Commission in Reserve 26004, a class A nature reserve for the purpose of 'Conservation of Flora and Fauna'
Other Crown land				
Reserve 41076	Conservation park	class A	81.48	Subject to the expiry of shell grit mining and negotiation with the Shire of Shark Bay, incorporate into the proposed 'Nanga Conservation Park'

NOTE: All lands to be vested with the Conservation Commission of Western Australia.

11 – Existing and Proposed Tenure

Key Points:

- The planning area comprises the existing reserves Francois Peron National Park, Dirk Hartog Island National Park, Shell Beach Conservation Park, Zuytdorp Nature Reserve, Bernier and Dorre Islands Nature Reserve, and many island nature reserves.
- The proposed terrestrial reserve additions include the former pastoral leases of Nanga, part Murchison House, part Tamala, part South Peron and part Carrarang.

The objective is to protect conservation reserves of the planning area by providing maximum security of tenure and purpose.

This will be achieved by:

1. implementing the proposed tenure and purpose changes as outlined in Table 2 and 3;
2. seeking endorsement of the proposed conservation reserve names as stated in Table 3; and
3. continuing to make acquisitions as property becomes available, subject to an assessment of its natural values against the criteria for a CAR reserve system.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
11.1 Tenure actions for which the Department and Conservation Commission are responsible.	11.1 Complete all tenure actions for which the Department and Conservation Commission are responsible within the life of the plan.	After five years
11.2 Names of proposed reserves changed.	11.2 To formally name the proposed reserves as outlined in Table 3 within 5 years.	After five years

12. PERFORMANCE ASSESSMENT AND MONITORING

In relation to management plans for the lands vested in it, the functions of the Conservation Commission under section 19(1)(g) of the CALM Act (see Section 12 – *Performance Assessment and Monitoring*) are:

- to develop guidelines for monitoring and assessing the implementation of the management plans by the Department;
- to set performance criteria for assessing and auditing the performance of the Department in carrying out and complying with management plan(s); and
- to assess and audit the performance of the Department in carrying out and complying with management plan(s).

It is not efficient to measure all aspects of management given resource and technical impediments—consequently, indicators will target key components of the plan. Each key performance indicator comprises evaluation of a measure and target, reporting requirements and a management response to any shortfall.

The Department is responsible for providing information to the Conservation Commission to allow it to evaluate the success of the Department's management in meeting targets specified in the KPIs. The frequency of these reports will depend upon the requirements of each KPI. Where a report identifies a target shortfall, a response to the Conservation Commission is required. The response will identify factors that have led to the target shortfall, and propose alternative management actions where appropriate. The Conservation Commission will consider the Department's response on the target shortfall and evaluate the need for action in the context of its assessment and audit function under section 19(1)(g)(iii) of the CALM Act. The Conservation Commission will make the results of audits available to the public.

The application of a KPI is identified for relevant sections throughout the plan.

13. ADMINISTRATION

For administrative purposes, the Department is structured into nine Regional centres that are further sub-divided into Districts. The planning area is, for the most part, in the Shark Bay District of the Midwest Region. The part of Murchison House Station included in the planning area currently lies in the Geraldton District. The day-to-day implementation of the final management plan will be the responsibility of the District Manager, Shark Bay District, who coordinates the operational management of parks and reserves in the planning area.

There is an existing operational centre at Shelter Bay in the proposed Edel Land National Park. This site will continue to be the primary operational centre for this part of the planning area and may be expanded in future as resources are made available. A new operational centre will be established on Dirk Hartog Island National Park. A preliminary assessment of the island has identified a site adjacent to Herald Bay as a potential operational centre. However, before a site can be developed, more detailed analysis, assessment and detailed site plan is required as well as obtaining standard departmental and Government approvals.

14. TERM OF THE PLAN

This management plan is for a period not exceeding 10 years and comes into operation from the date that a notice is published in the Gazette. However, the plan shall remain in force until it is amended or revoked and a new plan is approved and substituted for it. At any time, the plan may be amended.

PART C. MANAGING THE NATURAL ENVIRONMENT

The biota of the terrestrial environment of the Shark Bay area is affected by a range of ecological processes including climate, geomorphology, hydrology and soils. Shark Bay is at the meeting point of three major climatic regions. Due to its geographical position Shark Bay is influenced by the winter rainfall of the south-west and the summer rainfall of the north but its arid to semi-arid climate makes rainfall irregular. The Shark Bay environment is extremely saline.

Shark Bay is of great zoological and botanical importance, containing habitats of many species at the limits of their range. Shark Bay contains several endemic plant and animal species that are present because of the climatic, geomorphological, hydrological and soil conditions. This is of importance not only because of their presence but also for understanding the biological evolution of the area.

Shark Bay forms the transition zone between two major botanical provinces – the South West dominated by eucalypt species and the Eremaean dominated by acacia species. The coastal areas are dominated by heath and scrub-heath with windblown, almost prostrate shrubs adjacent to the Zuytdorp cliffs. Further inland are mallee or banksia shrubs and heaths with wattle-sheoak thickets and occasional eucalypt woodlands in sheltered areas.

Shark Bay is also an area of major zoological importance primarily as a result of the isolation of habitats on peninsulas and islands. Some fauna species that have become extinct on the mainland have survived on these islands.

At the regional scale, the ecology of the Shark Bay area is strongly influenced by the long, narrow and isolated prongs and islands and the local climate generated by them, particularly temperature and rainfall. The large size of the area and relative intactness of the vegetation ensure the maintenance of the integrity of ecological processes.

The major foci for managing the natural environment for the term of this plan are to:

- contribute to the establishment and management of a comprehensive, adequate and representative (CAR) reserve system by progressing the proposed reserve additions described in this plan;
- contribute to the ecological restoration of Dirk Hartog Island through the management of introduced species and the reintroduction of native animal species;
- maintain the status of reintroduced animals in Peron Peninsula;
- establish a wildlife tourism venture based on threatened species;
- control introduced animals, in particular foxes, goats, cats and rats;
- increase knowledge into the effects of buffel grass and its control, and subsequent rehabilitation of affected areas;
- improve knowledge of the biodiversity attributes of the Shark Bay area to provide the basis for informed decision making; and
- establish the scientific and management basis for protecting the values of the region from the impacts of unavoidable future climate change.

Various departmental policy statements provide management directions for managing the natural environment:

- proposed Policy Statement No. 9 – *Conserving threatened species and ecological communities* (subject to final consultation) (CALM 1992);
- Policy Statement No. 19 – *Fire management* (CALM 2005b);
- Policy Statement No. 29 – *Translocation of Threatened Flora and Fauna* (CALM 1995);
- Policy Statement No. 31 – *Management of reserves for the conservation of nature* (CALM 1990a);
- Policy Statement No. 33 – *Conservation of Threatened and Specially Protected Fauna in the Wild* (CALM 1991);
- Policy Statement No. 34 – *Visual resource management of lands and waters managed by CALM* (CALM 1989);
- Policy Statement No. 50 – *Setting Priorities for Conservation of Western Australia's Threatened Flora and Fauna* (CALM 1994);

- Policy Statement No. 62 – *Identification and Management of Wilderness and Surrounding Areas* (CALM 2004);
- Proposed Policy Statement *Management of Pest Animals on CALM-managed lands* (subject to final consultation); and
- Proposed Policy Statement *Environmental Weed Management* (subject to final consultation).

Like each of the nine regions within the Department's Regional Services, the Midwest Region has developed a *Nature Conservation Service Plan.* The plan addresses landscape scale threatening processes that are driving the increasing number of species and ecological communities in decline across the region. It provides a basis for the delivery of nature conservation across the region for a three-year period 2009-12, with a focus on outcomes based management and the role of active adaptive management in managing natural values within the Midwest Region. The plan acknowledges that describing outcomes targets for natural values in the region is difficult given that the level of monitoring and benchmark surveys has been limited and that condition trends are generally unknown and unlikely to detected over this three year period. A similar situation also applies within the planning area. Where applicable, management actions, targets and performance measures from the Midwest Nature Conservation Service Plan that apply to the planning area have been incorporated into this management plan.

15. BIOGEOGRAPHY

The goal of the National Reserve System Program (NRSP) is to assist with the establishment of a comprehensive, adequate and representative system of protected areas to conserve Australia's native biodiversity (EA 1999a). The development of the NRS draws upon the framework provided by the Interim Biogeographic Regionalisation for Australia (IBRA) endorsed by ANZECC in 1995 and based upon several scientific data and reserve system design principles (EA 1999a). The IBRA regions were derived by compiling climate, lithology/geology, landform, vegetation, flora and fauna, land use and other attributes as needed (EA 1999a).

The Directions for the National Reserves System – A Partnership Approach (Natural Resource Management Ministerial Council 2004) outlines a policy framework for the future development of a terrestrial component of a National Reserve System to achieve an Australian system of protected areas as a major contribution to the conservation of our native biodiversity on a regional scale. It builds upon the 1999 guidelines to develop a National Reserve System. Several reports have documented the expansion of the conservation reserve system in Shark Bay (see Section 1 – *Brief Overview*). The proposed terrestrial reserve additions will add considerably to conserving the IBRA regions of the area.

The pattern of species composition in Shark Bay is influenced by environmental processes operating at two geographical scales. At the biogeographical scale, patterns of flora and fauna assemblage composition are related to the differences between Eremaean and South-western biotas, and correspond to the area's arid-to-mesic and temperate-to-tropical climatic gradients, but can be mitigated by coastal effects (McKenzie *et al.* 2000d). At the local scale, patterns are related to topographic, vegetation and/or soil properties (McKenzie *et al.* 2000d). The conservation reserve system needs to sample the geographical extent of the various climatic and soil gradients identified by the analysis if evolutionary processes are to be protected by them (McKenzie *et al.* 2000d). This can be done at a biogeography regional or sub-regional scale as well as at a finer vegetation association scale.

The planning area includes the transition zone between the South-western and Eremaean Botanical Provinces, that is, the transition between the temperate and eucalypt dominant to the more arid and acacia dominant zones of Western Australia. The boundary definition of this botanical transition zone has been the subject of considerable research and debate.

The State Government is progressively establishing a comprehensive, adequate and representative conservation reserve network[3] in Western Australia. The report, *Establishment of a Comprehensive, Adequate and Representative Terrestrial Reserve System in Western Australia* (CALM 2003), recognises that the benchmark level of reservation for each bioregion to create a CAR reserve system using nationally recognised standards is seen as 15% (CALM 2003).

[3] Comprehensiveness – inclusion of the full range of ecosystems recognised at an appropriate scale within and across each bioregion. Adequacy – the maintenance of the ecological viability and integrity of populations, species and ecosystems. Representativeness – the principle that those areas that are selected for inclusion in reserves reasonably reflect the biotic diversity of the ecosystems from which they derive.

Three bioregions occur across the planning area: Carnarvon, Geraldton Sandplains and Yalgoo. As of June 2011, 11.2% of the Carnarvon bioregion (8 427 589 ha) is managed by the Department with 3.3% within existing reserves and 7.7% in former pastoral leases to be set aide for conservation purposes. In the Geraldton Sandplains bioregion (3 140 474 ha), 39.8% is managed by the Department, with 30.0% within existing reserves and 2.6% in former pastoral leases. In the Yalgoo bioregion (5 087 154 ha), 32.5% is managed by the Department, with 9.9% within existing reserves and 21.5% in former pastoral leases. Therefore the Carnarvon bioregion does not meet CAR requirements and the Geraldton Sandplains is at the threshold level for CAR.

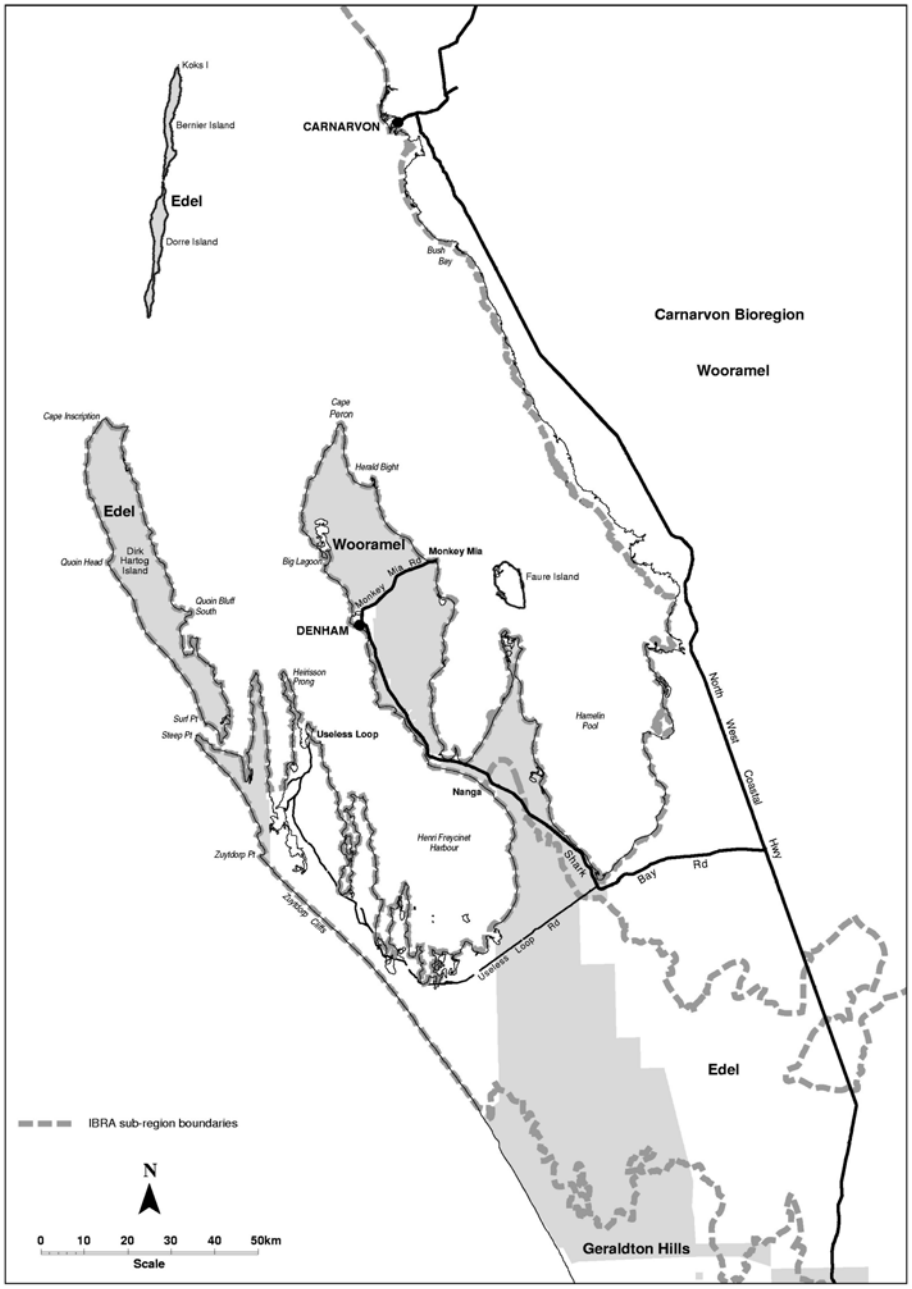


Figure 5: IBRA sub-regions of the Shark Bay Area

Carnarvon Bioregion

The Carnarvon bioregion is subdivided into the Wooramel and Cape Range subregions. Only the southern part of the Wooramel subregion (6 049 069 ha) occurs in the planning area. Within the sub-bioregion, 9.8% is

managed by the Department. Of this, 3.7% within existing reserves and 6.1% is in former pastoral leases to be managed for conservation purposes.

Within the planning area, the existing reserves including Francois Peron National Park and Shell Beach Conservation Park are located in the Wooramel subregion. Additions to these reserves and the creation of new ones, including part South Peron and part Nanga, will add to the lands managed by the Department within the Wooramel subregion. However, Department-managed lands are still unlikely to meet minimum CAR requirements. Figure 5 provides details of the size and location of the sub-bioregions.

Geraldton Sandplains Bioregion

The Geraldton Sandplains is subdivided into the Geraldton Hills and Lesueur subregions. Only the northern part of the Geraldton Hills subregion (1 968 330 ha) occurs in the planning area. Within the sub-bioregion 38.98% is managed by the Department with 30.2% within existing reserves 4.2% in former pastoral leases to be managed for conservation purposes.

Within the planning area, part of the Zuytdorp Nature Reserve is located in the Geraldton Hills subregion. Additions to this reserve, including part Murchison House and part Tamala, will add to the lands managed by the Department within the Geraldton Hills subregion. Figure 5 provides details of the size and location of the sub-bioregions.

Yalgoo Bioregion

The Yalgoo bioregion is subdivided into the Tallering and Edel subregions. Only the Edel subregion (1 588 211 ha) occurs in the planning area. Within the sub-bioregion 48.65% is managed by the Department with 27.11% within existing reserves and 21.07% in former pastoral leases to be managed for conservation purposes.

Within the planning area, most of Zuytdorp Nature Reserve, Dirk Hartog Island and Bernier and Dorre Islands Nature Reserve are located in the Edel subregion. The reserve additions including part Tamala, part Nanga and Edel Land will add considerably to the lands managed by the Department within the Edel subregion. Figure 5 provides details of the size and location of the sub-bioregions.

15 - Biogeography

Key Points:

- The *Directions for the National Reserves System – A Partnership Approach* (Natural Resource Management Ministerial Council 2004) outlines a policy framework for the future development of a terrestrial component of a National Reserve System to achieve an Australian system of protected areas as a major contribution to the conservation of our native biodiversity on a regional scale. It builds upon the 1999 guidelines to develop National Reserve System.
- The State Government is progressively establishing a comprehensive, adequate and representative (CAR) conservation reserve network in Western Australia.
- The planning area lies within the Carnarvon, Geraldton Sandplains and Yalgoo bioregions and occupies three sub subregions, Wooramel, Edel and Geraldton Hills (Figure 5).
- The existing reserves and proposed reserve additions will contribute towards achieving the minimum 15% benchmark for protecting sub-bioregions, although not all sub-bioregions will achieve this.
- The existing reserves and proposed reserve additions are unlikely to adequately provide representation of all vegetation associations across the Shark Bay area (see Section 20 – *Native Plants and Vegetation Associations* and Map 4).

The objective is to achieve a comprehensive, adequate and representative conservation reserve system to protect biodiversity within the Shark Bay area.

This will be achieved by:

1. acquiring lands to deliver a reserve system that meets the criteria of comprehensiveness, adequateness and representativeness (CAR);
2. acquiring, by purchase or exchange and when opportunities arise and funds are available, areas within or adjoining the planning area that have significant natural, cultural or recreational values, or management benefits that could assist in protecting the planning area;
3. implementing the recommendations of the *Shark Bay Terrestrial Reserves Management Plan 2000-2009*

(2000) and referring to the *EPA Conservation Reserves* (1976) and *Shark Bay Regional Strategy* (1997) recommendations;
4. negotiating with relevant land holders and managers to add areas under their control that have important key values to the conservation estate; and
5. taking into account any refinements to the Interim Biogeographic Regionalisation for Australia over the life of this management plan.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
15.1 The percentage of land managed for conservation purposes.	15.1 Minimum 15% of each sub-bioregion.	Annually

16. WILDERNESS

There is a growing awareness from within the community and the scientific world that wilderness areas support values that should be protected from the impacts of modern technological society. These values include:

- maintenance of the integrity of ecological processes, with wilderness areas including the most natural land remaining;
- protection of biodiversity;
- maintaining opportunities for solitude, inspiration and self-reliant recreation;
- providing an insight into the past and a baseline for management in the future; and
- representing a vast store of knowledge, ideas and genetic resources yet to be discovered from which human society will continue to benefit. The protection of the biodiversity of wilderness areas helps maintain the widest range of options for the future.

The World Conservation Union defines wilderness as a "…large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition".

The Australian Heritage Commission (now called the Australian Heritage Council) developed the National Wilderness Inventory (NWI) in 1986 following community concern over the decline in the area and quality of remote and natural land in Australia.

The Commonwealth Department of Department of Sustainability, Environment, Water, Population and Communities is the custodian of the NWI. This database is designed to identify wilderness quality across Australia. The NWI uses a quality index rating of 0 to 20, with 20 being the highest quality. The following four criteria are used to estimate the quality of wilderness across the landscape:

- remoteness from settlement – how remote a site is from permanent human occupation;
- remoteness from access – how remote a site is from established access routes;
- apparent naturalness – the degree to which a site is free from permanent structures associated with modern technological society; and
- biophysical naturalness – the degree to which a site is free from biophysical disturbances caused by the influence of modern technological society.

Wilderness areas are created under section 62(1)(a) of the CALM Act, although there are currently none gazetted. To support the legislation, the Department has developed *Policy Statement 62 – Identification and Management of Wilderness and Surrounding Areas* (CALM 2004) that incorporates the NWI criteria and specifies a NWI wilderness quality index of at least 12 and a minimum size of 20 000 ha in arid, semi-arid and tropical areas.

To guide the assessment of whether wilderness should be gazetted within the planning area, the main points from Policy Statement No. 62 that will influence whether any gazetted wilderness areas within the planning area are to be established include:

- natural processes and communities will be maintained and, where possible, restored by protecting them from unnatural disturbances and maintaining ecological processes;
- biodiversity will be protected from threatening processes, agents and activities;

- use of mechanised transport is not permitted within wilderness, except for emergency or essential management operations, or reasons of cultural importance;
- education and/or recreation expeditions will be permitted within wilderness. Commercial recreation and tourism is not permitted within wilderness (CALM Act leases and licenses cannot be issued for wilderness classified under section 62 of the Act);
- constructed walk trails, signs, track markers and toilets will not be provided in wilderness;
- management of wilderness and surrounding areas will be consistent with the principles in the Malimup Communiqué[4];
- wherever possible, ground disturbing activities for fire management will be conducted outside of wilderness. This includes construction and maintenance of access roads, firebreaks, fuel-reduced buffers, and water points;
- prescribed burning within wilderness may be carried out for the protection and maintenance of biological values and processes as determined through the preparation of area and regional management plans and interim management guidelines;
- appropriate fire protection strategies according to established standards will be implemented in areas that surround wilderness where life, property and natural resource values may be threatened; and
- any existing vehicle tracks and constructed walk trails within wilderness that are not required for emergency and essential management purposes will be closed.

Policy Statement No. 62 sets out the general guidelines for management of any gazetted wilderness areas and surrounding buffer areas with regards to managing the key values and threats to wilderness values of the areas. Any gazetted wilderness areas within the planning area will correspond with the most remote of the visitor management settings and be consistent with the finalised policy on wilderness.

The NWI assessment indicates that the planning area contains large areas of potential wilderness in the 'Zuytdorp area', which meets the minimum size criteria of 20 000 hectares of NWI wilderness quality of 12 or above (Map 3). However there is only limited knowledge of native flora and fauna, vegetation communities in the area and there is a need for further research of biological assets. There is potential for the reintroduction of native species no longer found in the area and there are a large number of introduced animals (camels, goats, foxes, cats and very occasionally deer) present. In addition the World Heritage status of the majority of the Zuytdorp area and the recommended tenure as class A nature reserve provides adequate protection to this area.

Therefore no wilderness areas will be gazetted in the Zuytdorp area in this management plan. However, a precautionary approach to the management of this area will be adopted until further analysis is undertaken. Extraordinary management operations, other than those compatible operations that have been normally undertaken in this area (fire, weed, feral animal and threatened species management) will not be permitted. This will allow the area to be managed over the life of the plan to enable future consideration of a wilderness area.

Much of the high quality wilderness contained within the Zuytdorp area is located on proposed additions to the conservation estate (ex-Tamala Station and ex-Nanga Station) (see Section 11 – *Existing and Proposed Tenure*). Consequently, addition of these areas will considerably increase the wilderness values of the planning area and will provide potential for wilderness to be created in the future.

16 - Wilderness

Key Points

- The NWI provides an index rating of wilderness quality from 0 to 20, with 20 being the highest quality based on four indicators.
- The NWI database can test different scenarios for mapping wilderness areas within the parameters of the four indicators.
- A 'wilderness area' is an area that has a NWI wilderness quality rating of 12 or greater and meets a minimum size threshold of 20 000 hectares in arid areas.
- Management activities in wilderness areas and in areas that surround wilderness have the potential to impact wilderness values.
- The Zuytdorp area contains a considerable area of wilderness quality 12 or above.
- There is limited knowledge of the native flora and fauna, introduced plants and animals and cultural

[4] The Malimup Communique was developed between indigenous communities, government authorities and non-government environmental groups in May 1998 at Malimup Springs in Western Australia. It is concerned with indigenous people and the management of areas reserved/zoned as wilderness, primarily within national parks, or other lands reserved for conservation or recreational purposes.

values of the Zuytdorp area where wilderness quality has been identified.
- It is not proposed for the Zuytdorp area to be gazetted as a wilderness area as part of this management plan, although an approach of precautionary management in this area will enable future consideration of it being declared as a wilderness area.

The objective is to identify and provide statutory protection to wilderness areas and maintain and enhance wilderness qualities.

This will be achieved by:
1. controlling impacts on potential wilderness areas;
2. monitoring areas mapped as having wilderness quality (see Map 3) to ensure wilderness quality is maintained throughout the life of plan; and
3. deferring the decision to declare wilderness in the Zuytdorp area until further research and information gathering has been undertaken.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
16.1 The amount of knowledge gathered (through research projects) relating to the Zuytdorp area.	16.1 The amount of knowledge gathered (through research projects) relating to the Zuytdorp area increases over the life of the plan.	Every five years.

17. CLIMATE AND CLIMATE CHANGE

Shark Bay has a semi-arid to arid climate, characterised by hot dry summers and mild winters. Average maximum temperatures during summer in Denham peak at 31.8°C and average minimum temperatures in the summer are up to 22.5°C. Average maximum temperatures at Hamelin Pool are higher during the summer, peaking at 36.9°C. Minimum temperatures in the summer are comparable to Denham, peaking at 21.2°C. In winter, the lowest average monthly maximum temperature in Denham is 21.7°C and the lowest minimum temperature is 12.8°C. At Hamelin Pool during the winter, the lowest average monthly maximum is 20.7°C and lowest minimum is 9.2°C (BOM 2007). The average annual rainfall is low, with an average of 216.3mm received at Denham and 206.7mm at Hamelin Pool. Most rain falls between May and July (about 156.9mm during these months for Denham). Rainfall during the summer is generally low (between 1.3mm in December and 14.7mm in February), although occasionally, there is rain from cyclones during the summer. However, these do not add a large amount of rain to the annual average. The annual evaporation rate ranges from 3000mm in the east to 2000mm in the west. The Shark Bay environment is extremely saline.

The Shark Bay area is influenced by the south-east trade winds which generate southerly winds for most of the year. During the summer at Denham, southerlies commonly blow consistently for several days at over 25kmh with maximum gusts up to 80kmh. There are periodic summer/autumn cyclones which generate winds with gusts up to 260kmh.

Observed and Projected Climate Change

Recent research on climate change in Australia suggests that:

- rainfall will continue to decline (by approximately 10% in winter and spring rainfall by 2030) and temperatures will continue to increase;
- river flows will decline as a result of decreased rainfall;
- weather events may be more extreme, with more frequent and prolonged drought;
- there will be an increase in the number of days of very high and extreme fire danger; and
- there may be an increase risk of more frequent bushfires.

(Source: CSIRO 2007, Hughes 2003, Williams *et al.* 2001).

The Western Australian Greenhouse Taskforce (2004) and CSIRO (2007) listed the following changes evident in the Western Australian climate: rising daily average temperatures; consistent regional trends in rainfall changes with likely decrease in rainfall in the south-west and the trend in the northern regions being to wetter conditions; and changes in the Leeuwin current. Given the climatic characteristics of the Shark Bay area in which the probability of occurrence of precipitation events is so important, magnitude/frequency considerations become especially significant.

Impacts of Climate Change

Climate change presents an additional pressure for native species and ecosystems as well as exacerbating existing pressures such as habitat fragmentation/modification, competition by introduced species and altered fire regimes. The *National Biodiversity and Climate Change Action Plan 2004-2007* (Department of the Environment and Heritage 2004) identifies potential impacts of climate change on Australian species and ecosystems as including:

- reductions in the geographic range of species;
- changes to the timing of species' lifecycles;
- changes in population dynamics and survival;
- changes in location of species' habitats;
- increases in the risk of extinction for species that are already vulnerable;
- increased opportunity for range expansion of invasive species;
- changes in the structure and composition of ecosystems and communities;
- changes in coastal and estuarine habitat due to rising sea levels; and
- changes in plant growth and ecosystem function arising from increased carbon dioxide concentration in the atmosphere.

Climate change is likely to bring increases in acidity of oceans and ambient marine temperatures leading to coral bleaching events, increases in storm surges and consequent damage to infrastructure and coastal habitat, and increased vectors carrying viruses leading to reduced human health.

Other species and communities that may be more vulnerable to climate change include those with:

- very limited or restricted climatic ranges;
- limited dispersal ability;
- very specialised habitat requirements; and
- small populations and/or low genetic diversity (DEH 2004).

Within the Shark Bay area there are a number of native flora and fauna species and communities that are endemic or at or near the limits of their range and which are likely to be particularly vulnerable to climate change. Other species may benefit from changes in the Leeuwin current (e.g. Spanish mackerel and other tropical fish are now being recorded in Shark Bay). Since Shark Bay is located at a transition zone for many species of flora and fauna, monitoring the impacts of climate change will be important. Therefore Shark Bay has the potential to become a focal area for monitoring the impacts of climate change. Although the effects of climate change may not be apparent over the life of this plan, it is important that effective monitoring programs be established to support the long-term regional-scale planning necessary to limit the potential impacts as much as possible.

Responses to Climate Change

UNESCO has stated that World Heritage Properties need to develop strategies for managing climate change. In Western Australia a new climate change adaptation and mitigation strategy is being developed. The Department has also commenced development of biodiversity response modelling to investigate the potential vulnerability of Western Australia's plants and animals to climate change and a climate-biodiversity strategy.

At the individual reserve level, implementing strategies that create reserves, control pest animals and weeds, manage fire, and re-introduce threatened native plants and animals, will help improve the resilience of species and ecosystems and hence decrease their vulnerability to climate change. In addition, strategies that aim to rehabilitate vegetation and reduce overgrazing by introduced and native herbivores will assist in increasing the amount of carbon that is sequestered in the land. There is a need for research and monitoring to establish baseline data to enable measurement of changes over time. This will also enable managers to recognise when specific threatening climate circumstances are occurring and respond effectively.

17 - Climate and Climate Change

Key Points:

- The Shark Bay area is in the transition zone between the South-west and Eremaean botanical provinces, contains native flora species that are at the limits of their range and therefore likely to be impacted by climate change.

- The Shark Bay area is in the transition zone between tropical and sub-tropical zones for many species of terrestrial and marine fauna and therefore likely to be impacted by climate change.
- Predictions for climate change suggest that by 2030, annual average temperatures will be 0.4 to 2.0 °C higher over most of Australia, with slightly less warming in some coastal areas. By 2070, it is predicted that annual average temperatures will increase by 1 to 6 °C (0.8 to 5 °C in the south-west).
- While the impact of climate change on native flora, fauna and ecological processes in the Shark Bay area is uncertain, vulnerable species and ecosystems are expected to experience significant effects, many of them detrimental.
- Strategies are required to improve understanding and increase the resilience of natural systems to anticipated incremental climate changes.
- Reserve creation, introduced pest and weed control, fire management and re-introduction programs can help to improve the resilience of species and ecosystems within the Shark Bay area, and decrease their vulnerability to climate change.
- Areas of high biodiversity value merit concentrating management resources to monitor and protect against inappropriate fire regimes and other impacts.
- Emergency response strategies will be required for some potential climate impacts such as extreme weather events.

The objective is to understand the effects of climate change on the native biota and natural systems in the Shark Bay area and apply adaptive management principles as required to ameliorate the impact of these changes.

This will be achieved by:

1. investigating the potential vulnerability of species and communities to climate change in the Shark Bay area (in particular species and communities of special conservation significance which are likely to be highly vulnerable to climate change) through testing the extent to which key life cycle events are temperature dependent and what water availability thresholds might exist to identify management priorities and the limitations of in-situ conservation options;
2. establishing baseline surveys of specific flora (e.g. Eremaean and South-west botanical species), fauna (e.g. Project Eden species) and ongoing ecological and climate monitoring sites to monitor changes in plants and animals in the long term;
3. continually reviewing and adapting management in response to new knowledge and understanding of climate change and its impact on biodiversity;
4. identifying climate thresholds for threatened species and communities in the planning area;
5. incorporating the potential for climate change impacts , including extreme events into threatened species and communities recovery plans or interim recovery plans for flora and fauna and developing effective response strategies;
6. limiting non-climate stresses for all species and communities, including those that are vulnerable to climate change;
7. identifying, reserving and protecting key climate refugia;
8. wherever possible, aiming to reduce greenhouse gas emissions and improve energy efficiency when designing infrastructure and facilities; and
9. protecting adequate and appropriate space within the reserve system to provide buffers and corridors, especially for climate refugia (e.g. implementing proposed additions to the public conservation estate as indicated in Section 11 – *Existing and Proposed Tenure*).

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
17.1 The size of populations of threatened fauna on islands within the planning area, subject to natural variations.	17.1 The size of populations of threatened fauna on islands within the planning area increases, subject to natural variation.	Every five years.
17.2 The size of populations of priority and other specially protected plant species on islands within the planning area, subject to natural variation.	17.2 The size of populations of priority and other specially protected plant species on islands within the planning area increases, subject to natural variation.	Every five years.

18. GEOLOGY, GEOMORPHOLOGY AND SOILS

Geology

The significance of the geology of the planning area contributed towards the nomination of Shark Bay as a World Heritage Property particularly the stromatolites found in Hamelin Pool. The Shark Bay area is part of the Carnarvon Basin, a geological feature along the western and north-western coastline of Western Australia. It ranges in width from 50 to 300 km and contains more than 6000 m of sedimentary rock spanning the Ordovician to Quaternary (434 to 0.01 million years ago) (Hocking *et al.* 1987). Within the Carnarvon Basin, Shark Bay lies in the Gascoyne Platform, a north-south elongated, tilted platform which contains mostly Silurian, Devonian (434 to 354 million years ago) and Cretaceous (65-1.6 million years ago) sedimentary rocks (Hocking *et al.* 1987). The appearance of the Peron, Nanga and Edel Land Peninsulas is due to the presence of anticlines (peninsulas) and intervening anticlines (gulf) that first developed during the Tertiary Period. The abrupt line of the Zuytdorp Cliffs is thought to mark one of the most prominent Pleistocene to early Holocene (1.6-0.01 million years ago) fault scarps in Australia.

The surface geology of the Shark Bay area comprises limestone and sandstone originally deposited as dune and marine sediments during the Pleistocene and Holocene (less than 2 million years BP) (Playford 1990). The five Pleistocene units are described as follows:

- *Peron Sandstone* – red aeolian sandstone which accumulated as a series of interlocking longitudinal and transverse dunes, primarily exposed on Peron Peninsula;
- *Tamala Limestone* – a succession of aeolian limestone dune deposits most of which probably accumulated during glacial periods of the Pleistocene when sea levels were much lower than they are today. They are found mostly on the Edel Land Peninsula;
- *Dampier Limestone* – shelly limestone deposited under conditions of normal marine salinity. This is the oldest marine Pleistocene unit and is found on the shores of Hamelin Pool;
- *Depuch Formation* – formed by the erosion and reworking of older Pleistocene units forming narrow strips along the east side of Edel Land Peninsula; and
- *Bibra Limestone* – beach-ridge deposits, with some tidal-flat and coralline deposits, exposed along parts of the Shark Bay coastline especially Hamelin Pool.

Between the Pleistocene dune ridges are evaporite deposits that form birridas (salt flats). They consist largely of gypsum and are probably Pleistocene in age.

The Holocene units comprise sand, calcrete and beach deposits that are found extensively throughout the Shark Bay area, most notably around the shores of Hamelin Pool as stromatolites and the Hamelin Coquina (Playford 1990). The coquina comprises a succession of beach ridges, in a belt up to 1 km wide and 4 m thick, around the shores of Hamelin Pool and L'haridon Bight. The stromatolites are built through sediment-trapping and/or precipitation by benthic microbial communities, principally cyanobacteria (Playford 1990).

Geoheritage

A formal register of State Geoheritage Sites for Western Australia is being developed. Nominated geoheritage sites are based upon the recommendations of the Geological Society of Australia and are defined by the Director of the Geological Survey of Western Australia as, "Geological features considered to be unique and of outstanding value within Western Australia and to have significant scientific and educational values for the good of the community".

A number of features across Shark Bay warrant assessment for geoheritage including the Zuytdorp Cliffs, Faure Island, Faure Sill and Hamelin Pool. Hamelin Pool Marine Nature Reserve contains the most diverse and abundant examples of stromatolites in the world. Although outside the planning area, this contributed to satisfying one of the World Heritage criteria. The stromatolites found here are of great importance as 'living fossils', resembling the stromatolites dated 3.5 to 3.9 billion years BP and one of the earliest known evidence of life on earth. The size, depth and geomorphological features combined with salinity make the Hamelin Pool basin environment unique in modern seas. The Faure Sill is a key element in the formation and maintenance of the hypersaline pool.

Geomorphology

The distinct geomorphology of the planning area contributed towards its nomination as a World Heritage Property. The unusual landforms of the area include the striking Zuytdorp Cliffs; Shell Beach; the islands, prongs and peninsulas; and the birridas, lagoons and coastal cliffs of Peron and Nanga Peninsulas. Many of the coastal landforms are fragile and can be degraded by uncontrolled vehicle access, pedestrian use and grazing.

Hocking *et al.* (1987) recognised three broad geomorphological zones in the Carnarvon Basin: coastal, transition and inland. The planning area is mostly located within the coastal zone with some parts in the inland zone. The three geomorphological regions in the planning area are:

- *Peron* – characterised by stabilised, unconsolidated, red, quartzose sand dunes fixed by sclerophyllous scrub and found on Peron and Nanga Peninsulas and Faure Island;
- *Edel* – characterised by calcareous, unconsolidated dunes deposited over the Tamala Limestone and found on Bernier, Dorre and Dirk Hartog Islands and Edel Land; and
- *Victoria Plateau* – characterised by gently undulating sandplain with minor dunefields and found on areas inland from the coast overlying calcrete developed on Cretaceous chalk.

Soils

Typically, the soils of Shark Bay are sandy. Payne *et al.* (1987) described four geomorphical districts based on soil types across the planning area:

- *Carbla Plateau* – occupies the thin strip of coast in the southeast corner of the Shark Bay World Heritage Property around Hamelin Bay. It contains shallow, stony, calcareous, gradational soils, with small marine shells, *Fragum erugatum*. Stromatolites and tidal mudflats are also present;
- *Coastal Dune* – occupies the western edge of Edel Peninsula and the islands to the north (Dirk Hartog, Dorre and Bernier). The soils are almost entirely uniformly sandy and generally calcareous;
- *Tamala Limestone* – includes areas adjacent to the Zuytdorp cliffs and some coastal areas between Denham and Nanga Station on the Peron Peninsula. The soils formed from the Tamala Limestone include brownish sands on undulating plains and sandplains; calcareous sands on the coastal dunes and sandplains; shallow lithosols on low hills and stony plains; shallow friable calcareous loams on stony plains and low rises; adjacent to limestone outcrops; and
- *Victoria Sand Plain* – occupies most of the Peron Peninsula and southern inland Shark Bay area. The soils are characteristically sandy and include slightly coherent, earthy sands on the flat to undulating plains; loose siliceous or brownish sands on the broad undulating plains; red or reddish-brown calcareous sands on Peron Peninsula, and deep, loose calcareous sands on the coastal dunes of Peron Peninsula. Birridas form where water seepage has brought dissolved gypsum to the surface, creating saline and gypsiferous deposits of clay, silt and sand.

Soil type will influence the amount of soil loss or movement, soil compaction, loss of vegetation, the potential intrusion of weeds and where developments may be situated.

Given the very sandy soils of the Shark Bay area, many, such as the coastal dunes, are particularly susceptible to erosion and take considerable time to rehabilitate (see Section 48 – *Rehabilitation*). Much of the coastal dune and Victoria Sandplain areas are contained within areas proposed to be added to the conservation estate (see Section 11 – *Existing and Proposed Tenure*). For example, Dirk Hartog Island and the part of Carrarang Station proposed to become Edel Land National Park is predominantly coastal dune and most of South Peron is Victoria Sandplain. Addition of these areas to the conservation estate will ensure that visitor and other activities are managed to reduce the threat of erosion to these fragile areas.

18 - Geology, Geomorphology and Soils

Key Points:

- The geology and geomorphology of the planning area is significant universal and contributed to its World Heritage listing.
- The unique geology of the area has resulted in the formation of evaporite deposits in the form of birridas, the coquina and stromatolites formations, and the occurrence of fossils.
- The soils of the planning area are, for the most part, highly susceptible to erosion, especially after vegetation clearing or disturbance.

The objective is to protect and conserve the geology, geomorphology and soils of the planning area.

This will be achieved by:

1. identifying geological and geomorphological features and soil types vulnerable to environmental damage and potentially threatened by introduced animals and human activities, and protecting these areas;
2. minimising soil disturbing activities in, and public access to, coastal dune areas that are likely to increase erosion risk and cause significant impacts (e.g. on significant species and communities, heritage sites, and infrastructure);
3. implementing strategies for the control and removal of stock and introduced animals that may cause erosion;
4. rehabilitating eroded areas, superfluous tracks and disturbed areas as necessary;
5. liaising with the Geological Survey of Western Australia to determine whether significant features across Shark Bay are worthy of consideration as geoheritage features;
6. promoting, encouraging and facilitating research into geological features such as birridas and shell deposits in L'haridon Bight;
7. identifying the biodiversity values of the birridas and establishing a monitoring program for birridas to quantify the impact of threatening processes; and
8. providing information to visitors to understand and appreciate the geological and geomorphological values of the planning area, its relationship with landforms, soils and vegetation and their vulnerability to damage.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
18.1 The condition of birridas within the planning area.	18.1 The condition of birridas within the planning area does not decrease over the life of the plan.	Every five years.

19. HYDROLOGY AND CATCHMENT PROTECTION

The Carnarvon Basin is generally lacking in permanent surface water due to low annual rainfall, high evaporation and permeable soil, and, as a result, there are few surface water features in Shark Bay. Freshwater soaks are scattered throughout the landscape (e.g. Freshwater Camp on Peron Peninsula) and sink holes in the limestone cliffs along the coast are known to store water for short periods. Wells have been dug into freshwater seeps along the coastline and can still be seen today along the eastern coastline of South Peron. There has been a long history of use of soaks and wells by people, both Indigenous and non-Indigenous (see Part D – *Managing Our Cultural Heritage*). Animals are also known to use the soaks and sink holes.

The Shark Bay area contains six significant hydrogeologic units (listed in order of oldest to youngest): Tumblagooda Sandstone, Kopke Sandstone, Nannyarra Sandstone, Birdrong Sandstone, Windalia Sand Member and Windalia Radiolarite. In addition there are several major aquifers and thin localised layers of less saline water that occur in the Peron Sandstone and Tamala Limestone. The three main aquifers are the Windalia Radiolarite, the Birdrong Sandstone and the Kopke Sandstone. The Cretaceous aquifers (Windalia Radiolarite and Birdrong Sandstone) extend over the entire sub-basin and the Palaeozoic Kopke Sandstone extends over most of the sub-basin south of Carnarvon. Wills and Dogramaci (2000) provide the following information on these three main aquifers:

- *Kopke Sandstone* – known thickness up to 415 m and is estimated to occur at minimum depths of 300 to 500 m in the Shark Bay area (increasing from east to west). It is a very significant aquifer for the Shark Bay area with salinities around 2000 to 3000 mg/L which is about one third of the salinity of the overlying Cretaceous aquifers;
- *Windalia Radiolarite* – thickness of 15 m and has both free flowing and non-flowing wells. The brackish water of this aquifer typically has a Total Dissolved Salts (TDS) of 4000 to 10 000 mg/L depending on locality; and
- *Birdrong Sandstone* – typically 20 to 30 m thick and intersected at depths between 200 (Hamelin Pool) and 450 m (Peron Peninsula). Free flowing bores with flow rates of 4500 m^3/day were numerous in the early stages of bore development but today flow rates do not exceed 1500 m^3/day, with the majority of pastoral bores flowing between 100-500 m^3/day (DoE 2004). Salinity depends on the location but varies between 3500 to 4500 mg/L TDS. The estimated recharge to the aquifer is 17 x 10^6 m^3 per year (DoE 2004) and in

2004 it was estimated that 22 x 10^6 m^3 per year is lost from the aquifer due to uncontrolled and corroded bores coupled with inefficient bore drain systems (DoE 2004).

There is an upward hydraulic gradient between the three main aquifers and all are capable of high yields (several thousand metres per day without pumping) depending on the location of bore and ground elevation. Consequently, the establishment of artesian bores provide a reliable water resource and assisted in the early settlement of Shark Bay and the development of the pastoral industry. The temperature of groundwater from artesian bores ranges from 32^0C to 62^0C (DoE 2004).

The groundwater in the Shark Bay area is thought to contain calcium carbonate, possibly as a result of passing through lime rich substrates, which may contribute towards the formation of the stromatolites and algal mats in Hamelin Pool (D. Walker pers. comm). Consequently, activities which impact on the quality and quantity of groundwater in the area may also impact on the stromatolites.

The interaction between surface water, groundwater and the surrounding environment can be a complex one. Hydrological flows and processes can be affected by a range of impacts. For example, existing roads, road construction and maintenance can affect ground and surface water flows through the planning area, particularly after rainfall events. Changes in fire regimes can also affect ground and surface water hydrology. New recreation site developments or changes to existing sites, if not properly planned, can also alter the hydrology of the area. Proper planning is therefore essential.

19 - Hydrology and Catchment Protection

Key Points:

- The hydrological systems of the planning area are important and necessary to maintain healthy ecosystems of the terrestrial reserves and adjoining marine reserves.
- Knowledge of the hydrological function of aquifers across the Shark Bay area is limited.
- The planning area contains significant artesian aquifers which assisted the early settlement and development of the pastoral industry.
- Surface water and groundwater hydrology can be affected by the construction and maintenance of roads, inappropriate fire regimes and recreation site developments.

The objective is to protect the health and condition of water resources within the planning area.

This will be achieved by:

1. assessing the condition of water quality and pressure in bores and determining management options;
2. liaising with relevant government agencies (e.g. Department of Water) regarding the management and monitoring of ground water quantity and quality to ensure the key values are protected;
3. consulting with adjoining land owners and managers, local authorities, other government agencies and stakeholders to ensure activities within adjacent areas do not significantly affect the hydrological, World Heritage and other values of the planning area and, if necessary, referring activities to the EPA for assessment where there may be significant impact on these values;
4. supporting ongoing research into hydrological aquifers and processes to ensure water extraction does not impact on World Heritage values; and
5. monitoring water quality and pressure from existing bores to ensure water extraction does not impact on World Heritage and natural values.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
19.1 The quality, quantity and pressure of water from uncapped bores within the planning area.	19.1 No further reduction in quality, quantity and pressure of water from uncapped bores within the planning area.	Every five years.

20. NATIVE PLANTS AND VEGETATION ASSOCIATIONS

The planning area is significant for flora, being located in the transition zone of two botanical provinces – the South West and Eremaean. As such, there are many endemic flora species and many species located at the northern and southern limits of their geographical range. Vegetation on Peron Peninsula and the former Nanga

station is mainly Eremaean and comprises the more arid-zone species such as desert *Acacias*, spinifex, samphire and heath. South West Botanical Province species occur along the coastal strip southwards from the central part of Tamala station, western parts of Zuytdorp Nature Reserve and northern parts of Murchison House station and are dominated by eucalypt species. The transition zone is most evident on parts of former Nanga and Tamala Stations, Carrarang stations, Dirk Hartog Island and Bernier and Dorre Islands (URS 2000). More recent studies have concluded that the Eremaean province includes the Wooramel and Edel Land bioregional sub-regions whilst the South West province includes the Geraldton sub-region (see Figure 5).

Knowledge about the vegetation and flora of the planning area has been limited until relatively recently. Botanical surveys have been completed in the Shark Bay World Heritage Property (Trudgen and Keighery 1995, Claymore and Markey 1999) Bernier and Dorre Islands (Royce 1962), Dirk Hartog Island, (Burbidge and George 1978), Useless Loop (Mattiske Consulting Pty. Ltd. 1996), and other islands (Alford, *et al.* 2000).

Flora

At a State level, the Department has the statutory responsibility under the Wildlife Conservation Act for flora conservation, and all flora native to Western Australia is protected under this Act.

The planning area has high species richness for flora, as a result of the overlap in temperate and arid zones. Western Australian Herbarium records show there are 820 taxa within the planning area, from 108 families (2005). It is likely this is not a true reflection of the total number of plant species and more intensive survey would no doubt uncover more species in the area. The largest families represented include the Myrtaceae (85 taxa, 10.4%), Asteraceae (74 taxa, 9.0%), Chenopodiaceae (53 taxa, 6.5%), Poaceae (47 taxa, 5.7%), Mimosaceae (40 taxa, 4.9%), Proteaceae (37 taxa, 4.5%), Euphorbiaceae (23 taxa, 2.8%), Amaranthaceae (22 taxa, 2.7%), Goodeniaceae (21 taxa, 2.6%) and Myoporaceae (20 taxa, 2.4%). These 10 families represent 56% of the total flora.

The influence of both the arid and temperate environments on the planning area is reflected in the composition of the flora, as well as its richness. Five of the families containing the most species are prevalent in the less diverse desert areas, including Amaranthaceae, Asteraceae, Goodeniaceae, Myoporaceae and Poaceae. In addition, there are many taxa from the species-rich South West Botanical Province, with species found in the northern heathlands and taxa from the Proteaceae and Myrtaceae families dominant (Keighery *et al.* 2000).

In the different parts of the planning area, the following numbers of plant species have been recorded (WA Herbarium 2005):

- Tamala – 304 species
- Dirk Hartog Island – 266 species
- Zuytdorp Nature Reserves – 210 species
- Carrarang – 208 species
- Bernier and Dorre Islands – 193 species
- Francois Peron National Park – 182 species
- Nanga – 169 species
- South Peron – 99 species

Flora of Conservation Significance

Threatened Flora

At a State level, nominated threatened flora species have statutory protection under the Wildlife Conservation Act. Threatened species normally go through a review process before being endorsed by the Minister. The Commonwealth EPBC Act provides a listing of nationally threatened species and ecological communities. While threatened species legislation is broadly similar across jurisdictions, there are different approaches to species listing, and therefore inconsistencies exist between State and National threatened species lists. The Commonwealth Government and the Department are currently in partnership to align the threatened species listed under the EPBC Act with flora listed under the Wildlife Conservation Act.

Under the EPBC Act *Eucalyptus beardiana* is listed as endangered and *Caladenia barbarella* is listed as vulnerable.

Declared Rare Flora

Native flora that is presumed to be extinct in the wild, likely to become extinct or rare is afforded special protection by being declared to be 'rare flora' under the Wildlife Conservation Act. These specially protected flora are sometimes referred to as 'Declared Rare Flora' (DRF), and are declared by the Minister for Environment by notice in the Government Gazette. A permit from the Minister is required before such flora can be disturbed in any way.

The planning area contains two DRF. These are *C. barbarella* and *E. beardiana* with *E. beardiana* occurring not on a conservation reserve.

Priority Flora

In addition to rare flora, the Department also refers to 'priority' species. This classification applies to both flora and fauna species. These are species that may be rare but there is insufficient survey data available to accurately determine their true status, or which are rare but not currently listed as threatened or DRF and hence are being monitored. Although priority species do not have the same level of legislative protection as rare flora, the priority flora list is maintained as a mechanism to highlight flora of special conservation interest and encourage appropriate management activities in areas such as weed control (see Section 23 – *Environmental Weeds*), fire management (see Section 26 – *Fire*) and site development.

Species are grouped from Priority 1 to Priority 5 (see *Glossary* for explanation), each with their own definition according to the perceived urgency for further survey. Priority species occurring in the planning area are described in Appendix 2.

- Priority 1 – there are 10 species known from the planning area;
- Priority 2 – there are 20 species known from the planning area;
- Priority 3 – there are 20 species known from the planning area;
- Priority 4 – there are 6 species known from the planning area; and
- Priority 5 – there are no species known from the planning area.

Endemic and Relictual Flora

Trudgen and Keighery (1995) suggest there are 53 taxa endemic to the Shark Bay World Heritage Property, most of these being geographic races (varieties or subspecies) of species that are widespread. It is suggested this is a result of the large fluctuations in climatic conditions that have occurred in Shark Bay over time, promoting the speciation and evolution of endemic species.

Vegetation Associations

The vegetation associations across the Shark Bay area are described using the National Vegetation Information System (NVIS). NVIS was developed to provide a consistent description of vegetation and detailed vegetation data across Australia. The NVIS Framework provides a comprehensive means of describing and representing vegetation types based on establishing relationships between structural and floristic information (DEH 2003). The NVIS Information Hierarchy is based on six levels and the dataset describes the NVIS vegetation attributes from the highest level (NVIS Level I) through to species and growth forms in each sub-stratum (NVIS level VI).

The Shark Bay World Heritage Property is significant because it contains the transition zone between the temperate South West and arid Eremaean Botanical Provinces. As such it contains many threatened and endemic plant species as well as species at the limit of the southern or northern ranges. This boundary represents the transition between the species rich heathlands, woodlands of the South West and the less diverse vegetation of the Carnarvon Basin.

There has been much debate over the location of this boundary. The patterns in species composition are influenced by environmental processes operating at two geographical scales. At the biogeographical scale, patterns were related to the differences between the Eremaean and South Western biotas and corresponding to the area's arid–to–mesic and tropical–to–temperate climatic gradients but mitigated by coastal effects in the northern part of the area, whilst at the local scale patterns were related to topographic, vegetation and/or soil attributes (McKenzie *et al.* 2000c). In 2005, the boundaries of the NVIS and IBRA regions (version 6.1) were aligned (see Section 15 – *Biogeography*). The Geraldton Hills sub-region lies within the South West botanical province whilst the Edel Land and Wooramel sub-regions lie within the Eremaean botanical province.

Map 4, *Vegetation Communities of the Planning Area*, applies NVIS Level VI data to map the vegetation communities across the Shark Bay area.

Land proposed to be added to the conservation estate as part of this management plan will increase the range and number of vegetation communities protected in the reserve system. For example the spinifex hummock grasslands with *Acacia* shrubs are only found on Dirk Hartog Island. Similarly, shrublands with tree-heath between sandhills of *Banksia ashbyi* are only found on the former Nanga Station and part of the former Tamala Station. The proposal to create the Edel Land National Park will provide protection to the transition zone between the temperate South West and arid Eremaean Botanical Provinces. In addition, this proposed national park will provide protection to a large majority of the hummock grassland with dwarf shrub steppe and mixed eucoid shrubs and spinifex found in the area. Consequently, additions proposed in this management plan will provide greater protection to a greater range of vegetation communities in the area.

Bernier, Dorre & Koks Islands

The following vegetation associations have been identified on Bernier and Dorre Islands:

- on Bernier Island, open hummock grassland of spinifex (*Triodia plurinervata*) with mallee (*E. oraria, E. obtusiflora* subsp. *dongarraensis*) and *Melaleuca cardiophylla, Thryptomene baeckeacea*, *Acanthocarpus preissii* and *Beyeria cinerea* shrubs;
- on both islands thicket shrubland of Acacia (*A. ligulata, A. sclerosperma, A. tetragonophylla*) shrubs over chenopods and shrubs of *Atriplex bunburyana*, *Ptilotus obovatus* and *Scholtza leptantha*;
- on the west coastline dwarf scrub open heath of *Diplolaena dampieri*, *Scaevola crassifolia* and *Westringia rigida*; and
- patches of drift sand, rocky outcrops and samphire.

Shark Bay Islands

Pelican Island, located east of Peron Peninsula is comprised of sand and mud, bare sands and low shrubs of *Nitraria billiardierei*.

All the other island nature reserves, located to the west of Peron Peninsula are composed of limestone and range in size from 0.1 to 160 hectares. Most of the islands are made up of low cliffs with limestone rubble slopes and a central plateau of shallow soil supporting a *Nitraria billardierei* shrubland. Islands with dune systems have low heaths of a range of different species including *Olearia axillaris*, *Diplaleana grandiflora*, *T. baeckeacea*, *Sarcostemma australe*, *Atriplex cinerea, Rhagodia latifolia, A. rostellifera, A. ligualata* and *S. crassifolia*. Behind the beaches (where these occur), there are herbfields or grasslands of *Spinifex longifolius* or *Sporobolus virgincus*.

Guano mining has occurred on 11 of the islands and where this has happened the *Nitraria* shrubland has been replaced by the herbs *Calandrinia polyandra*, the grasses *Setaria dielsii* and *Bromus arenarius* and the weeds *Chenopodium murale* and *Sonchus oleraceus* (Beard 1976).

Peron Peninsula

The following vegetation associations have been identified on Peron Peninsula:

- open shrubland of predominantly *Acacia ramulosa*;
- thicket dominated by *Acacia* (*A. ligulata, A. sclerosperma, A. tetragonophylla*) shrubs over *Atriplex bunburyana*, *Ptilotus obovatus*, *Scholtzia leptantha*, *Solanum orbiculatum* and *Tephrosia* sp. shrubs;
- on the west coast north of Peron Homestead, thicket dominated by *Acacia* (*A. ligulata, A. tetragonophllya*) and *Lamarchea hakeifolia* with *Alyogyne cuneiformis* and *Exocarpus sparteus*; and
- on the southern part of the peninsula, predominantly hummock grassland (*Triodia plurinervata*) with a mixed sparse shrubland of scattered *Acacia* (*A. ligulata, A. sclerosperma, A. tetragonophylla*), sometimes with *Bossiaea walkeri* and *Diplolaena dampieri* associated with calcrete pavements, over *Atriplex bunburyana*, *Ptilotus obovatus* and *Schoitzia umbellifera* shrubs chenopods or shrubs.

There are smaller areas of mixed open chenopod shrubland of *Atriplex* sp. *Halosarcia* sp., *Bossiaea walkeri* and *Frankenia* sp. associated with the birridas on the eastern side of South Peron. There is a small area of open hummock grassland (*T. plurinervata*) north of Peron Homestead. There are small mangrove communities at Big Lagoon, Guichenault Point and Dubaut Creek below the high water mark and therefore outside the terrestrial reserve area.

The hummock grassland on the southern part of the peninsula is not represented in the current conservation reserve system.

Nanga Peninsula

On Nanga Peninsula two bioregional sub-regions (Edel Land and Wooramel) meet and provide some interesting botanical changes. The former Nanga station is dominated by tree heath community with bowgada shrubland in the northern part. The main vegetation associations on Nanga Peninsula are:

- open shrubland of *Acacia* (predominantly *A. ramulosa, A. aneura, A. sclerosperma* and *A. tetragonophylla*) over *Dodonaea inequifolia, Eremophila platycalyx* and *Labichea cassoides* over *Stipa elegantissima, Podolepis canescens* forb or tussock grass; and
- tree heath dominated by *Banksia ashbyi*, *Eremaea pauciflora*, mallee (*E. beardiana*) over *Adenanthos acanthophyllus, Calytrix brevifolia* and *Conospermum stoechadis* shrubs.

There are smaller areas of mixed open chenopod shrubland of *Atriplex* sp., *Halosarcia* sp. and *Frankenia* sp. associated with birridas on the western side of the peninsula.

Zuytdorp Area

In the Zuytdorp area, two bioregional sub-regions (Edel Land and Geraldton Hills) meet and it is also the location of the transition zone between the South West and Eremaean Botanical Provinces. As such, the area represents some of the more interesting and complex vegetation communities. The main vegetation associations in this area are:

- across the southern part of the former Nanga and Tamala stations and most of Zuytdorp Nature Reserve, mixed shrubland of banksia and adenanthos dominated by *B. ashbyi, E. pauciflora*, mallee (*E. beardiana*) over *A. acanthophyllus, C. brevifolia* and *C. stoechadis* shrubs;
- in the northern part of Zuytdorp Nature Reserve, an area of adenanthos mixed shrubland between the sandhills dominated by *Adenanthos acanthophyllus, Calytrix brevifolia* and *Conospermum stoechadis* shrubs sometimes with *B. ashbyi, E. pauciflora* and mallee (*E. beardiana*);
- along the western coastline, melaleuca mixed heath with *Actinostrobus pyramidalis, A. ligulata* and mallee (*Eucalyptus erythrocorys*) over *Melaleuca leiopyxis, Allocasuarina humilis* and *Calothamnus chrysantherus* shrubs; and
- in the southern part of Zuytdorp Nature Reserve and northern part of Murchison House station, mixed heath of *Verticordia* and *Acacia* shrubland with *A. longispines, Actinostrobus arenarius* and mallee (*E. beardiana*) over *Verticordia picta, Melaleuca scabra* and *Calothamnus blepharospermus* shrubs.

Within the area there are smaller patches of:

- in the sheltered areas, thicket dominated by *A. rostellifera*;
- *Adenanthos* mixed heath dominated by *Adenanthos acanthophyllus, Calytrix brevifolia* and *Conospermum stoechadis*; and
- adjacent to the western coastline, tussock grassland dominated by *Spinifex longifolius* whilst slightly inland closed scrub-heath dominated by *Diplolaena dampieri* or scrub-heath of *Anthocercis littorea* with *A. ligulata* and *Olearia axillari*s shrubs.

Edel Land

Apart from the extensive bare areas of drift sand, the Edel Land area covering the proposed national park consists of a single vegetation association:

- open hummock grassland of spinifex (*T. plurinervata*) sometime with *Melaleauca cardiophylla, T. baeckeacea*, sometimes with *Acanthocarpus preissii, Atriplex* sp. and *Diplolaena dampieri* and sometimes with *Atriplex* sp., *Frankenia* sp. and *Senecio lautus* shrubs, depending on the proximity to the exposed western coastline.

The wider Edel Land area is a complex area of several different vegetation communities. There are several other vegetation associations that occur to the south of the proposed national park that are currently not within the existing and proposed conservation reserve system. There are small areas of mangrove communities on the eastern side of Edel Land below the high water mark.

Dirk Hartog Island

The main vegetation associations on Dirk Hartog Island are:

- spinifex hummock grassland with on overstorey of either *A. coriacea*, *Pittosporum phylliraeoides* over *A. ligulata*, or *Diplolaena dampieri*, *Exocarpus sparteus* shrubs over *Triodia* sp. In other areas *Acanthocarpus preissii* and *Atriplex bunburyana* chenopods or shrubs over hummock grasses across the majority of the island; and
- mixed open chenopod shrubland of *Atriplex* sp., *Olearia axillaris* and *Frankenia* sp. adjacent to the western coastline and slightly inland in more protected sites, *T. plurinervata*, *Triodia* sp., *Melaleuca huegelii*, *T. baeckeacea* and *Atriplex* sp.

There are patches of bare areas of drift sand across the island. In some parts there are a few birridas. On the east coast there are small patches of mixed open heath of *Diplolaena dampieri*, *Myoporum* sp. and *Conostylis* sp. shrubs.

20 – Native Plants and Vegetation Associations

Key Points

- The planning area is significant for flora, being located in the transition zone of two botanical provinces – the South West and Eremaean. The boundary between these two provinces lies to the south of the peninsulas, extending in a south-easterly direction.
- There are 820 taxa within the planning area, from 108 families, although this is not a true reflection of diversity and further surveys would highlight more taxa.
- There are 2 species of declared rare flora, 10 Priority One species, 20 Priority Two species, 20 Priority Three species and 6 Priority 4 species in the planning area (see Appendix 3).
- There is a diverse range of vegetation complexes found on Peron Peninsula, Edel Land, Dirk Hartog Island, Bernier and Dorre Islands, other island nature reserves, the Zuytdorp System and the Tamala System.

The objective is to identify, protect and conserve the diversity and distribution of specially protected and other native plants and vegetation associations within the planning area.

This will be achieved by:

1. identifying native plants and vegetation associations, that may require special protection, and implementing appropriate strategies to minimise the impacts from threatening processes, such as climate change (see Section 17 – *Climate and Climate Change*), environmental weeds (see Section 23 – *Environmental Weeds*), problem animals (see Section 24 – *Introduced and Other Problem Animals*), inappropriate fire regimes (see Section 26 – *Fire*) and recreation development (see Part E – *Managing Visitor Use*);
2. determining a list of indicator species to enable measurement of the impacts of threatening processes;
3. continuing to document the flora from data already collected;
4. seeking to include more areas containing vegetation associations that are not well represented in conservation reserves or proposed reserve additions;
5. conducting additional vegetation mapping to gain a better understanding of the condition of vegetation associations;
6. conducting additional surveys and monitoring, especially for rare, priority and poorly known flora, and opportunistically collecting voucher specimens for the Western Australian Herbarium and the Department's Midwest Regional Herbarium and Shark Bay District's Herbarium;
7. surveying for threatened species in areas proposed for disturbance (e.g. road construction and maintenance, facility development);
8. assessing any proposals to adjust the boundaries of the planning area by reference to representativeness criteria including, for example, the distribution and status of rare and priority flora;
9. recording the location of threatened and priority flora and maintaining information for the State database;
10. liaising with local government and private landholders to promote compatible management on adjoining lands;
11. encouraging further research on species of conservation significance (particularly in relation to life history attributes and population dynamics) and the threats to them (such as susceptibility to disease, response to fire, reproduction biology, taxonomy and age to maturity), and modify management

accordingly;
12. establishing appropriate long term vegetation monitoring plots to measure the recovery, condition, species composition and recruitment following pest animal removal, particularly on Dirk Hartog Island, and re-assessing the ones already established on Francois Peron National Park;
13. ensuring any vegetation mapping at a more detailed scale is consistent with NVIS;
14. rehabilitating degraded areas, where disturbance is severe, with species natural to the area and natural regeneration is less likely to occur (see Section 48 – *Rehabilitation*); and
15. highlighting to visitors the significance of the flora and vegetation (such as rare and poorly collected taxa) to better understand and appreciate the native plants and vegetation of the Shark Bay area.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
20.1 Population size[5] and/or number of populations of critically endangered flora species located.	20.1 Increase in population size and/or number of populations of critically endangered flora species located.	Every five years
20.2 Species composition, structure and vegetation density within vegetation associations.	20.2 Maintain or improve the species composition, structure and vegetation density of vegetation associations.	Every five years

21. NATIVE ANIMALS

The planning area contains a high diversity of native fauna and is of considerable international, national and local zoological significance. This is due to the location of the planning area within the transitional zone where the temperate climate of the South West gives way to the semi-arid climate of northern areas. Hence, many species are found at the limits of their northern or southern ranges. The many peninsulas and islands have also protected numerous species from disturbances that have occurred in other parts of the State. These areas support the only remaining populations of a number of native animals which were once widespread on mainland Australia. There are also numerous endemic and relictual species and subspecies (those which evolved when Australia was part of the supercontinent Gondwana).

The islands and peninsulas at Shark Bay are highly significant because they act as refuges for threatened species and provide an environment that encourages genetic variability within native plants and animals. They are also important for migratory birds. These reasons have contributed to the significance of the Shark Bay as a World Heritage area.

The significance of the area's fauna also contributed towards its nomination as a World Heritage Area (see Section 4 – *Key Values*). Shark Bay satisfies the criteria for having, "the most significant habitats where threatened species of animals and plants of outstanding universal value from the point of view of science and conservation still survive". Reserves in the planning area also contain a number of species which are threatened. There are 17 threatened species and three specially protected species under the Wildlife Conservation Act (see Appendix 4). Three species are listed as endangered and nine species are vulnerable under the Commonwealth EPBC Act (see Appendix 3). Finally, the IUCN lists one species as critically endangered, three species as endangered, seven species as vulnerable and two species as near-threatened (see Appendix 3).

Project Eden

State wide, the Western Shield program focuses on the control of introduced predators and the reintroduction and recovery of native fauna. As part of this program, Project Eden involves the management of introduced animals and the reconstruction of the original native fauna populations on Peron Peninsula and northern parts of Nanga Peninsula in Shark Bay. It commenced in 1995 and since then has resulted in the removal of sheep and the majority of goats from Peron Peninsula as well as the effective control of foxes and partial control of cats. A barrier fence has been constructed at Taillefer Isthmus to assist in control of introduced animals.

Animal translocations commenced in 1997 and species that have been returned to Shark Bay include the greater bilby (*Macrotis lagotis*), woylie or brush-tailed bettong (*Bettongia penicillata*), quenda or southern brown bandicoot (*Isodon obesulus*) and malleefowl *(Leipoa ocellata*). There have also been attempts to reintroduce to

[5] Population size is defined as the number of mature/reproducing plants.

the peninsulas banded hare wallabies (*Lagostrophus fasciatus*) and rufous hare wallabies (*Lagorchestes hirsutus*) but these have been unsuccessful due to cat predation.

Native animals from the captive breeding centre near Peron Homestead have been introduced or reintroduced to other areas of Shark Bay and other parts of the State. Fauna has also been reintroduced from other parts of Australia. In addition, fauna reconstruction is being carried out by other organisations. For example, greater stick-nest rats (*Leporillus conditor*), were reintroduced to Salutation Island from South Australia in 1990. Part of the Heirisson Prong peninsula in Edel Land was fenced by the CSIRO and the local community, and the boodie was introduced in 1992 and 1995, the western barred bandicoot and the Shark Bay mouse were reintroduced in 1995 and the greater stick nest rat was introduced in 1999 (CALM 2000). This project is now managed by Useless Loop Community Biosphere Project Group (ULCBPG). The Australian Wildlife Conservancy (AWC) purchased the Faure Island pastoral lease and, in cooperation with the Department, the Perth Zoo, CSIRO and the ULCBPG, translocated the Shark Bay mouse and the boodie in 2001 (AWC 2002). Since then the banded hare wallaby, western barred bandicoot and greater stick-nest rat have been reintroduced to Faure Island.

Project Eden has resulted in an increase in numbers of extant animals such as echidnas, large reptiles such as the woma python, and other small and large mammals. The removal of sheep and goats has also resulted in an overall increase in vegetative cover which has benefited the protection of small animals from predators.

Since the inception of the project, Project Eden has significantly contributed to wildlife conservation across the State and much has been learnt about the effective control of introduced animals and the factors that influence their control such as rainfall, type of bait, effectiveness of aerial and ground baiting and effects of alternative prey such as rabbits on the success of control.

Community education is an integral component of Project Eden and a range of media have been produced to promote the project. The project has also enabled many volunteers to be involved in the monitoring and maintenance of fauna populations. The construction of an animal viewing enclosure to enable visitors to view threatened animals has been proposed to provide additional interpretive and educational opportunities (see Section 33.1 – *Wildlife Encounters* and Part G – *Involving the Community*).

For the time being and until more effective rabbit and cat control options are developed, reintroductions of native fauna on the peninsulas will be limited to supplementation of existing released populations and the possible release of other potential candidate species such as the red-tailed phascogale and chuditch. The project will focus on maintaining the achievements to date by continuing to protect reintroduced species, control of feral animals at current levels, continuing community education and maintaining the breeding centre to provide source stock.

Dirk Hartog Island Ecological Restoration

Dirk Hartog Island was established a national park in 2009. The intent is to implement a similar wildlife conservation project to Project Eden on the island once stock and introduced animals are removed (sheep, goats and cats). The vision is to remove the introduced predators and herbivores then to reconstruct the ecological integrity of the island over the next 10-30 years.

The ecological restoration of Dirk Hartog Island will commence with the initial removal of sheep and goats. Although the removal of introduced predators and herbivores will use existing tracks as much as possible, the construction of narrow monitoring tracks in the dense vegetated areas at 2km intervals and in a grid pattern and suitable for use by ATVs, may be required. This will have a detrimental visual impact for the duration of the feral animal control and monitoring period. Vegetation clearing associated with the construction of these grids will require appropriate approvals. These transects will be used to monitor the presence of cats after the initial baiting. Further baiting may be required to ensure cats have been removed. Only after cats have been removed will native fauna be introduced and reintroduced to the island.

The project will also involve the control of introduced plants (particularly from the southern part of the island where past pastoral activities were focussed), establishment of an education program, establishment of an operational centre, rubbish removal, fire management, soil erosion management, hygiene control and rehabilitation.

Heirisson Prong and Faure Island

In 1989, the Useless Loop Community Biosphere Project Group (ULCBPG) was formed to manage the northern tip of Heirisson Prong for conservation purposes rather than as a pastoral lease. The project sought to reconcile utilisation of natural resources (salt harvesting, sheep farming) with the protection and enhancement of natural values (wildlife conservation, recreation).

Similar to Project Eden, construction of a 1.8 km fence across Heirisson Prong has created a sanctuary for threatened fauna on a mainland peninsula at Shark Bay. In partnership with Shark Bay Salt Joint Venture, CSIRO scientists and volunteers, the community group at Useless Loop maintains the fence, undertakes regular tracking, trapping and baiting of predators in both the 12 square kilometre fenced enclosure and a buffer area to the south, and regularly monitors reintroduced mammal populations. The Heirisson Prong project is based on the UNESCO 'Man and the Biosphere' program (UNESCO 2007).

Three species of threatened mammal have been re-introduced to Heirisson Prong: the burrowing bettong in 1992, the western barred bandicoot in 1995 and the greater stick-nest rat in 1999 (Wildlife and Research Management Pty Ltd 2005). Mammals from Heirisson Prong have been supplied to other reintroduction sites including Dryandra Woodland, Faure Island and Roxby Downs in South Australia.

CSIRO has withdrawn from the project and it is now being managed solely by ULCBPG with Shark Bay Resources providing. The Department will continue to provide advice and assistance with aerial baiting operations. The project will be monitored over the next three years and should community support for the program decline, the project will be wound up and CSIRO will provide support to translocate animals to Peron Peninsula, Faure Island or other appropriate sites.

AWC, a not-for-profit organisation funded by public donations, purchased the 5816 ha Faure Island pastoral lease in 1999. Although not in the planning area, the island represents a unique opportunity to contribute to the conservation of several threatened mammal species, by providing an island refuge from introduced predators that are common on mainland Australia (Australian Wildlife Conservancy 2005). Stock has been removed from key habitats and is now confined within fences. Feral cats and goats have been eradicated. Five species of threatened mammal have been re-introduced: the burrowing bettong (2002), the Shark Bay mouse (2002), the banded hare-wallaby (in 2004, 2005 and 2006), the western barred bandicoot (2005), and the greater stick-nest rat (2006).

These projects involve cooperation between the Department, AWC and ULCBPG, especially in the exchange of a number of threatened species between Project Eden, Heirisson Prong and Faure Island. These projects have made important contributions to wildlife conservation, to improving understanding of the biology and ecology of threatened mammals and associated threatening processes.

Native Fauna

Mammals

The planning area has an unusually high diversity of terrestrial mammal fauna, as has been shown in a number of biological surveys of the area (Burbidge and George 1978, Short *et al.* 1992, McKenzie *et al.* 2000a). Overall, 34 species of mammal currently exist within Shark Bay. Of these, there are nine species of kangaroo or wallaby, ten species of rodent, six bat species, five dasyurids (carnivorous marsupials) and two species of bandicoot (McKenzie *et al.* 2000a). By comparison, many large reserves in the South West, where vertebrate fauna have shown a declining trend, support around 20 species. For example, the Fitzgerald River National Park has 22 species and both the Stirling Range and Shannon-D'Entrecasteaux National Parks have 20 species.

Of the 34 mammal species, only two are endemic to Western Australia (the white-tailed dunnart and the honey possum). Most of the mammal fauna have wide patterns of distribution. Baynes (1990) reports half of the mammal fauna from the Shark Bay area are widespread in both arid and South-western areas, five South-western species are at the northern extent of their range and there are eight arid species for which Shark Bay represents their south-western limit. Furthermore, he suggests that most of the mammal fauna found on Bernier and Dorre Islands are part of the original mammal fauna found on the Shark Bay peninsulas or the mainland, rather than disjunct populations.

Birds

The diversity of bird fauna within the Shark Bay area is moderately high, with 245 species being recorded (WA Museum 2003, Johnstone, Burbidge *et al*. 2000). This is unusual as peninsulas tend to have low fauna diversities, being surrounded by sea and providing limited access for land dwelling species. This diversity is possibly attributable to the large variety of habitats and the transition zone between the arid north and the more temperate south. Birds on Edel Land are an extension of those found in the South West, whereas on Peron Peninsula there are a number of arid zone species. In addition, mangrove habitats on Peron Peninsula support a number of bird species only associated with mangroves.

Reptiles and Amphibians

The Shark Bay area has a very rich abundance of reptiles, supporting 120 species. The skinks are particularly well represented with 43 species. There is also an abundance of geckoes (19 species), elapid snakes (14 species), dragons (12 species), and legless lizards (12 species). There are six species of turtle that visit the islands and coastal parts of the Shark Bay area. This high degree of diversity of herpetofauna is likely attributable to the large variety of habitats and the transition zone between the arid north and the more temperate south.

Recent surveys (McKenzie *et al.* 2000b, Storr and Harold 1990) and Western Australian Museum records show only low species diversity for amphibians in the Shark Bay area. Ten species have been recorded and all of these, except one, are found no further north than the Zuytdorp Nature Reserve. Three of these species are distributed mainly in the South West, so the Shark Bay area represents the northern extreme of their range. Two of these species are found in more arid environments including the Shark Bay area which represents the southern limit of their range (Tyler *et al.* 2000).

Invertebrates

There have been relatively few surveys of invertebrates in the Shark Bay area. A biological survey of the Carnarvon Basin assessed the diversity of a number of invertebrate groups in the planning area. Halse *et al.* (2000) collected a total of 79 species of aquatic invertebrates from wetlands on Tamala, Carrarang and Hamelin Stations. However, from this study, it was suggested that the abundance and diversity of aquatic invertebrates is closely related to climatic variations and that there is a difference in fauna when wetlands are wet or dry and the resulting salinity levels. Two surveys of spiders within the planning area found 169 species of ground-dwelling spiders and 34 species of trapdoor spiders (Main *et al.* 2000 and Harvey *et al.* 2000a). The diversity of trapdoor spiders was greatest in the coastal parts of the planning area or in the transitional vegetation areas (i.e. between the Southwest and Eremean Botanical Provinces) which experiences higher winter rainfall. Similarly the distribution and abundance of ground-dwelling spiders was affected by environmental conditions such as rainfall and soil structure. A survey of centipedes and millipedes in the planning area found seventeen species (Harvey *et al*. 2000b). As with the spiders, the distribution and abundance of these was correlated with rainfall and soil texture conditions. There was a greater diversity of centipede species in drier areas, whereas millipedes tended to be restricted to areas which received higher rainfall.

The bivalve *Fragum erugatum* is the most significant invertebrate of Shell Beach Conservation Park and surrounds. Although this species lives within the marine environment, accumulations of the shells of these bivalves have, over a long period of time, resulted in spectacular white beaches and ridges such as Shell Beach and coquina (sedimentary rocks of lithified shells). This species is significant as it is one of few species to tolerate and thrive in the hypersaline inlets of Shark Bay, in particular Hamelin Pool (CALM 2000).

Fauna of Conservation Significance

The Commonwealth's EPBC Act provides a listing of nationally threatened fauna species. Most of the 'endangered' and 'vulnerable' vertebrate species listed under the EPBC Act that occur in the planning area are also listed as threatened under the State's Wildlife Conservation Act (see below and Appendix 3).

Threatened and Other Specially Protected Fauna

At a State level, the Department has the statutory responsibility under the Wildlife Conservation Act for fauna conservation, and all native fauna in Western Australia is protected under this Act. Nominated threatened fauna species normally go through a review process, then through a Ministerial endorsement process. The Western Australian Threatened Species Scientific Committee (WATSSC) is an independent scientific advisory body established by the Minister, which assesses the conservation status of communities and makes recommendations to the Minister regarding approval. The Wildlife Conservation Act provides for the Minister to declare fauna

species to be specially protected for the various reasons (see *Glossary* for explanation). A list of species is provided in Appendix 4.

- Schedule 1 – there are 20 species known from the planning area;
- Schedule 2 – there are no species known from the planning area;
- Schedule 3 – there are no species known from the planning area; or
- Schedule 4 – there is one species known from the planning area.

In addition to specially protected fauna, the Department also maintains a 'reserve list' of priority taxa (see *Glossar*y for explanation). A description of the specific threatening processes for specially protected and priority fauna is included in Appendix 3.

- Priority 1 – there is one species known from the planning area;
- Priority 2 – there are no species known from the planning area;
- Priority 3 – there are two species known from the planning area;
- Priority 4 – there are five species known from the planning area; and
- Priority 5 – there are two species known from the planning area.

The Department, often in collaboration with other State and Commonwealth agencies and other parties, prepares recovery plans for the most threatened species. There are recovery plans for the Shark Bay mouse and the woylie and an Interim Recovery Plan for the thick-billed grasswren (western sub-species). A combined draft recovery plan for the western barred bandicoot, banded hare wallaby and burrowing bettong has been prepared as has one for the rufous hare-wallaby but are yet to be approved.

The mammal fauna of the Shark Bay terrestrial reserves are of high conservation significance. On Bernier and Dorre Islands, five of the nine mammals present are listed as threatened under the Wildlife Conservation Act. These are the boodie, banded hare wallaby, rufous hare wallaby, western barred bandicoot and Shark Bay mouse. Bernier and Dorre islands represent the only naturally remaining populations for four of these species which were once widespread over arid and semi-arid parts of mainland Australia. These mammals are also listed as critically endangered, endangered, or vulnerable under the EPBC Act or internationally under the IUCN Red List. It has been suggested that 22 mammal species have disappeared from the mainland part of the planning area since European settlement (McKenzie *et al.* 2000a). Hence, the recovery of mammal fauna is a focus in the Shark Bay area.

In terms of extinctions, the bird fauna of the planning area has fared better than the mammals, with no species becoming extinct (Johnstone *et al.* 2000). Ten to fifteen percent of birds have declined and the planning area supports a number of threatened species. The Shark Bay variegated fairy wren, the Dirk Hartog black and white fairy wren, and the southern emu wren (Dirk Hartog Island sub-species) are all listed as threatened under the Wildlife Conservation Act. The Dirk Hartog Island rufous fieldwren, the Dorre Island rufous fieldwren, and the malleefowl are also listed as threatened under Western Australian legislation and the peregrine falcon is listed as specially protected. The thick-billed grasswren (*Amytornis textillis textillis*) is listed as vulnerable under the EPBC Act.

No species of reptile has become extinct since European settlement. However, there are a number of threatened and other significant reptiles in the planning area. The islands in the planning area provide important habitat for the loggerhead turtle (*Caretta caretta*), which is listed as threatened under the Wildlife Conservation Act and endangered under the EPBC Act and the IUCN Red List. Turtle Bay on Dirk Hartog Island and Dorre Island are important sites for turtle nesting. The Hawksbill turtle (*Eretmochelys imbricata*), the leatherback turtle (*Dermochelys cariacea*), the flatback turtle (*Natator depressus*) and the green turtle (*Chelonia myas*) are all listed as threatened under the Wildlife Conservation Act and are known to visit the islands of the planning area, but are not thought to breed there (Burbidge 2004). Green turtles have been recorded nesting on Bernier and Dorre islands by aerial surveys identifying tracks, but have not been observed on the ground. The Baudin Island spiny tailed skink (*Egernia stokesii aethiops*) is listed as threatened under the Wildlife Conservation Act, as vulnerable under the EPBC Act and is only found on Baudin Island. Similarly, the Western spiny-tailed skink (*Egernia stokesii badia*) is listed as threatened under the Wildlife Conservation Act, endangered under the EPBC Act, and is one of two disjunct populations, one found on Dirk Hartog Island and the other in the north-eastern wheatbelt. The Hamelin ctenotus (*Ctenotus zastictus*) is listed as threatened under the Wildlife Conservation Act, as vulnerable under the EPBC Act, and found only in a small area of mallee south of Shark Bay. Ramsay's python or woma (*Aspidites ramsayi*) is also found in the planning area and is listed as specially protected under the Wildlife Conservation Act.

Migratory Species

The planning area contains a number of significant migratory birds. Sixty-seven birds are migratory and are protected under international agreements with Japan, China, Republic of Korea or under the Bonn Convention. Most of these are seabirds and the islands in particular, and the coastlines of the planning area provide important breeding areas. Pelican Island, one of the planning area's island nature reserves, is one of only nine pelican breeding sites in Western Australia (CALM 2000).

Endemic, Relictual and Species at the Limit of their Geographic Range

The Shark Bay variegated fairy wren, the Dirk Hartog black and white fairy wren, and the southern emu wren are locally endemic, with the Shark Bay variegated fairy wren only found on Bernier and Dorre Islands. The Dirk Hartog black and white fairy wren and the Southern emu wren are both endemic to Dirk Hartog Island (Johnstone *et al.* 2000). The thick-billed grasswren (*Amytornis textillis textillis*) is also restricted in WA to the Shark Bay area (CALM 2000).

A number of southern bird species have their northern limits in the Shark Bay area including; regent parrot, yellow robin, golden whistler, Southern scrub-robin, blue-breasted fairy wren, striated pardalote (sub-species *westraliensis*), the brown-headed honeyeater, the rock parrot and the emu wren (Storr 1990). In addition, there are seven arid species of birds which have their southern limits in the Shark Bay area including; striated heron, Brahminy eagle, white-breasted whistler, mangrove grey fantail, dusky gerygone, yellow white eye and white-breasted woodswallow. These species depend on the mangroves found in the Shark Bay area. Other northern species such as the brolga, flock pigeon, blue-winged kookaburra and singing bushlark are also found at their southern limits in Shark Bay (Storr 1990).

Many south-western reptile species are found at their northern limits in the Shark Bay area. These include the geckoes *Diplodactylus michaelseni, D. spinigerus* and *Underwoodisaurus milii*; the pygopodid lizards, *Aclys concinna*, *Aprasia smithi*, *Delma australis, D. fraseri*, *Pletholax gracilis*, and *Pygopus lepidopodus*; the skinks, *Ctenotus fallens, C. lesueurii*, *Egernia baida, E. bos, E. kingii, E. stokesii*, *Morethia obscura*, and *Tiliqua rugosa*; the blind snake *Ramphotyphlops leptosoma*; and the elapid snakes *Neelaps bimaculata* and *Brachyurophis fasciolata*. There are also a number of northern species which are found at the southern extent of their range in Shark Bay. These include *Delma nasuta, Ctenophorus rubens, Ramphotyphlops grypus*, *Demansia calodera* and all marine turtles and sea snakes (Storr and Harold 1990).

The Shark Bay area provides habitat for a number of endemic and relictual reptile species. These include *Aclys concinna major*, *Aprasia haroldi*, *Pletholax gracilis edelensis*, the skinks *Ctenotus youngsoni*, *C. zastictus* and *Egernia stokesii aethiops*, the Shark Bay sea snake *Aipysurus pooleorum* and the sandhill frog *Arenophryne rotunda*. Twelve species of gecko and twelve species of pygopodid lizard are relictual species. There are also a broad range of fossil species including two pygopodid lizards, ten skinks, four blind snakes and five elapid snakes (Storr and Harold 1990).

21 – Native Animals

Key Points

- The known terrestrial vertebrate fauna of the Shark Bay area consists of 34 mammal species, 245 bird species and 120 reptile and amphibian species.
- There are 21 threatened and 10 priority animal species listed under the Wildlife Conservation Act in the planning area.
- Bernier and Dorre islands are internationally significant sites for rare and threatened mammal native fauna.
- Project Eden is a significant wildlife conservation program which has contributed to understanding wildlife management in Australia, particularly the effectiveness of predator control and native animal reintroductions.
- The proposed ecological reconstruction of Dirk Hartog Island provides an opportunity to improve the conservation status of several of the Shark Bay threatened fauna, showcase wildlife management on a relatively large scale and add to the value of Shark Bay as a premier wildlife conservation area.
- Fauna reconstruction is occurring on Peron Peninsula, Heirisson Prong, and Faure Island and is proposed to occur on Dirk Hartog Island.

The objective is to identify, protect and conserve specially protected and other native fauna and their habitats within the planning area.

This will be achieved by:

1. identifying key fauna habitats and, where possible, protecting them from threatening processes;
2. controlling threatening processes that are damaging or could potentially damage native fauna in ways that do not compromise other conservation objectives (see Section 24 – *Introduced and Other Problem Animals*);
3. continuing to conduct further biological survey and monitoring to determine the vital life history attributes and population status of fauna species in the planning area, including invertebrate fauna, with a focus on threatened, priority, endemic and relictual species;
4. establishing and maintaining regular (at least annual) monitoring of population size and condition of Bernier and Dorre threatened fauna, key characteristics of their habitat and island ecosystems, and potential threatening processes (fire, drought, disease, human visitation, feral predators, weeds). Developing appropriate management responses to deterioration in specific indicator measures and set specific criteria thresholds that will trigger these management actions;
5. encouraging and facilitating research into the effect of fire management strategies on the fauna, to ensure that adopted fire regimes do not disadvantage some species (see Section 26 – *Fire*);
6. assessing proposed developments and management activities for their potential impact on fauna and fauna habitats, including surveying for the occurrence of specially protected and priority species;
7. maintaining inventories (e.g. location records) of fauna and their habitats for specially protected and priority fauna species and reporting sightings of threatened or restricted fauna, and maintaining records, especially on the State database;
8. supporting the preparation and implementation of recovery and re-introduction/ translocation plans for specially protected species and, where necessary, other species in decline;
9. liaising with local government and private landholders to promote complementary management on adjoining lands;
10. providing information to visitors on fauna conservation programs, native fauna and their habitats of the Shark Bay area;
11. researching habitat requirements of selected threatened or restricted fauna and threatened ecological communities (see Section 57 – *Research and Monitoring*);
12. continuing to monitor turtle populations at Turtle Bay and restricting access as required;
13. commencing turtle population monitoring at Shelter Bay in the medium term developing appropriate management strategies and restricting access as required;
14. continuing captive breeding and maintaining reintroduced threatened native fauna or other locally extinct species on Peron Peninsula as part of Project Eden;
15. preparing and implementing a fauna reconstruction plan for Dirk Hartog Island including the removal of sheep, goats and cats, construction of monitoring tracks, subsequent reintroduction of native fauna and control of threatening processes across the island;
16. continuing to provide advice and support to the ULCBPG on Heirisson Prong as long as support from the community and Shark Bay Resources continues. Translocating animals from Heirisson Prong to Peron Peninsula, Faure Island or other appropriate sites should the project be wound up; and
17. promoting research findings from wildlife management at Shark Bay to other wildlife management agencies and organisations.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
21.1 The conservation status of the threatened species in the planning area.	21.1 No decline in conservation status in the planning area.	Every five years
21.2 Range, number and size of populations of threatened fauna species, listed under the Wildlife Conservation Act in the planning area.	21.2 The range, number and size of populations of threatened fauna species in the planning area increases over the life of the plan.	Every five years

22. ECOLOGICAL COMMUNITIES

An 'ecological community' is a naturally occurring biological assemblage that occurs in a particular type of habitat. In the Shark Bay area, examples of ecological communities include the coastal birridas, scrub-heaths, Acacia shrublands, woodlands associated with eucalypts in the southern parts of the area and hummock grasslands of spinifex. All ecological communities serve an important ecological function and so are intrinsically

significant. However, ecological communities that are particularly vulnerable include those with the following characteristics:

- a community that is restricted in its extent;
- particular habitats or ecosystems that contain sensitive species;
- communities that are threatened (e.g. Threatened Ecological Communities [TEC]); and
- communities that are species-rich or contain aggregations of endemic, disjunct or relictual flora species.

The planning area contains a range of terrestrial ecological communities which support a diverse fauna and flora. Knowledge of some communities is limited although many appear fragile and sensitive to disturbance. There is one TEC that occurs mostly in the marine environment and several other ecological communities at risk in the Shark Bay area (Table 4) (May and McKenzie 2003). The ecosystems at risk are those that the Department has limited knowledge on the impacts and long-term effects on their condition from threatening processes and warrant monitoring and protection.

Table 4: Threatened Ecological Communities and Other Ecosystems at Risk in the Shark Bay Area

Community	Status[6]	Threatening Processes
Threatened Ecological Community		
Hypersaline microbial community (Hamelin stromatolite)[7]	V, P4	Recreation, climate change leading to changed sea levels, nutrient enrichment
Other ecosystems at risk		
Reptile assemblages of islands, gulfs and peninsulas	V	Feral animals (cats, foxes, goats), grazing, changed fire regimes
Coastal heath communities at Steep Point	V	Grazing, feral animals (goats), clearances for proposed developments
Eucalyptus mallee sp. and Acacia scrub with scattered *E. loxophleba*	V	Increasing fragmentation, loss of habitat and lack of recruitment, grazing; feral animals (rabbits);changed fire regimes
Acacia rostellifera low forest	V	Increasing fragmentation, loss of habitat and lack of recruitment, grazing; feral animals (rabbits);changed fire regimes
Threatened fauna assemblages of Bernier and Dorre Islands	V	Changed fire regimes, recreation impacts.

Some important ecological communities are not represented within the existing conservation reserve system. The *Shark Bay Regional Strategy* (WA Planning Commission 1997) recommends additional areas for inclusion in conservation reserves to protect some of these terrestrial communities. The biological survey of the Carnarvon Basin recommended several terrestrial ecological communities which should be added to the reserve system, due to their high biodiversity values (McKenzie *et al*. 2000d). These include;

- temperate semi-arid sands containing coastal birridas, immediately south of Shark Bay – south part of Nanga and Tamala Stations, Zuytdorp Nature Reserve;
- temperate arid and semi-arid sands and samphires containing coastal birridas – Francois Peron National Park and South Peron;
- Edel land dune systems containing coastal birridas – north-western Edel Land;
- temperate mesic to semi-arid heaths and scrubs on sandplains – proposed additions to Zuytdorp Nature Reserve, south part of Tamala Station; and
- temperate mesic specialists – Zuytdorp Nature Reserve.

The Commonwealth's EPBC Act provides a listing of TECs and legislative protection is currently provided for TECs listed under this Act. However, under current State legislation, TECs are not afforded special protection (unlike individual flora and fauna). Currently, there are no TECs listed under the EPBC Act in the planning area.

[6] TECs are listed by WATSCU and approved by the WA Minister for Environment whilst ecosystems at risk are not formally approved.
[7] Although within the marine environment, terrestrial activities can have an impact on this community.

22 – Ecological Communities

Key Points

- There are no known TECs within the planning area. However some communities with high biodiversity values have been identified for inclusion in the conservation reserve system.

The objective is to identify, protect and conserve ecological communities of special significance within the planning area.

This will be achieved by:

1. identifying and protecting potential TECs or ecosystems at risk by listing them under appropriate legislation, such as the Commonwealth's EPBC Act;
2. assessing proposed developments that may impact on the natural values of potential TECs or ecosystems at risk;
3. reducing the threats to ecological communities and significant habitats by reducing the impact of threatening processes, such as climate change (see Section 17 – *Climate and Climate Change*) environmental weeds (see Section 23 – *Environmental Weeds*), introduced animals (see Section 24 – *Introduced and Other Problem Animals*) and inappropriate fire regimes (see Section 26 – *Fire*);
4. establishing and maintaining regular monitoring of the condition of TECs, ecological communities at risk and potential threatening processes (fire, drought, disease, human visitation, feral predators, and weeds). Developing appropriate management responses to deterioration in specific indicator measures and set specific criteria thresholds that will trigger these management actions;
5. maintaining appropriate fire regimes to maintain biodiversity, taking into account the requirements of 'fire regime-specific' species;
6. encouraging research into the habitat and ecology of potential TECs or ecosystems at risk, susceptible to threatening processes; and
7. providing information to visitors about the importance of ecological communities and significant habitats, and their vulnerability to human impact.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
22.1 The condition of TECs and ecological communities at risk.	22.1 There will be no decline in the condition of known TECs and ecological communities at risk.	Every five years.

23. ENVIRONMENTAL WEEDS

Environmental weeds are plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely; resulting in decline of the communities they invade (CALM 1999a). Environmental weeds displace native plants, particularly on disturbed sites, by competing with them for light, nutrients, water and space. They also change nutrient conditions, hydrological patterns, soil erosion patterns, light distribution, geomorphological processes, biomass distribution and substantially reduce regeneration of native plants. Environmental weeds can also have a significant adverse impact on other natural values by altering animal habitats, harbouring pests and diseases, and increasing fire hazard.

Environmental Weed Management

An integrated approach to environmental weed management was developed in the *Environmental Weed Strategy for Western Australia* (CALM 1999a). The Strategy is consistent with the State Weed Plan (SWP) (DoA 2001) which has been developed to help achieve coordinated and effective weed management throughout Western Australia.

The gazettal of the new *Biosecurity and Agricultural Management Act 2007* (BAM Act) meant the establishment of the new Biosecurity Council.
The Environmental Weed Strategy rates environmental weeds in terms of their environmental impact on biodiversity using the following criteria to rate each weed:

- *Invasiveness* – ability to invade bushland in good to excellent condition or ability to invade waterways;

- *Distribution* – wide current or potential distribution including consideration of known history of wide spread elsewhere in the world; and
- *Environmental Impacts* – ability to change the structure, composition and function of ecosystems and in particular an ability to form a monoculture in a vegetation community.

This rating provides the basis for identifying control priorities, with the highest rated species and species that pose a specific threat to natural values within the planning area, being a focus for weed management.

The Department's Policy Statement (draft) *Environmental Weed Management* (subject to final consultation) is used in conjunction with the *Environmental Weed Strategy* to guide the approach and priority setting for the control of environmental weeds on lands and waters managed by the Department. Priorities for action are to first control any weed that impacts on threatened or priority flora, fauna or ecological communities, or that occurs in areas of high conservation value, and then address environmental weeds rated under the *Environmental Weed Strategy* as high, moderate, mild and low in decreasing priority as resources allow. The Department commenced a weed risk management project in 2008 that will prioritise each of the 26 bioregions (see Section 15 *Biogeography*). The project will prioritise weed species according to their invasiveness, impacts, potential and current distribution and feasibility of control. It will also investigate the use of an environmental asset protection based approach for prioritising established weeds.

Options for environmental weed management include prevention, eradication, control, containment, or limited action. It is the preferred option to prevent the introduction of environmental weeds through appropriate management, as eradication is rarely feasible. Methods of control include managing disturbance, the use of herbicides, biological control, manual control, and control through the application of fire. Effective control programs encourage the growth of native species and the suppression of weeds with the overall aim of boosting the area's resilience to further weed invasion.

Environmental Weeds in the Planning Area

Within the planning area, weeds and non-native plants have been introduced as a result of European occupation and the pastoral industry, particularly in areas proposed to be added to conservation reserves, which were once pastoral leases. Many of these species have a very localised distribution, only occurring at the site where they were introduced, but some of the more effective colonisers have become widespread. Weeds are often transported by a number of vectors including flowing water, the faeces of animals and seed-eating birds, human transport, as wind-borne spores or as lightweight seed. The unsanitised use of equipment also significantly contributes to the distribution of weeds. To maintain or enhance the natural environment of the planning area, it is essential that these introduced plants are managed appropriately.

There are 75 weed species found within the planning area (WA Herbarium 2005, K Himbeck, pers. comm.) (see Appendix 5). This compares with 88 weed species recorded for the southern Carnarvon Basin (Keighery *et al.* 2000). These are likely to have been introduced as a result of pastoralism within the area. Weed numbers are low compared with other areas of Western Australia (Keighery and Longman 2004). This is probably due to the original vegetation still being largely intact (Keighery *et al.* 2000) and because of the harsher climate compared to the South West.

Weed species have had significant impacts on different parts of the planning area. Buffel grass (*Cenchrus ciliaris*), is widespread over Peron Peninsula and parts of Dirk Hartog Island. Buffel grass, a tough perennial bunch grass, was actively spread by the pastoral industry. Buffel grass displaces native species and can rapidly establish a monoculture. It favours lighter sandy soils, particularly along water courses. Buffel grass spreads through the dispersal of its fluffy burrs (seeds) by wind, water and animals, particularly along drainage lines and roads. Its spread along roads can also be assisted by vehicle draughts and movement of soils by grader and other vehicles (CRC for Australian Weed Management, Weed Management Guide Buffel Grass – *Cenchrus ciliaris*, 2008). It is also known to reproduce vegetatively, via rhizomes and stolon sprouts (Tu 2002). Control of buffel grass is difficult, with no single control method being effective, particularly in light of the landscape scale of control required in the planning area. Hence, the eradication of buffel grass within the planning area is likely to be impossible. The key to management of this species is the prevention of new infestations or control of small infestations where management can be effective.

The *Acacia* shrublands of the Zuytdorp Nature Reserve and Peron Peninsula have become infested with Mediterranean turnip (*Brassica tournifortii*), which has replaced *Parietaria debilis* as a result of sheep, rabbit and goat grazing pressures. African boxthorn (*Lycium ferocissimum*) is found on Peron Peninsula and Faure and Salutation Islands (Keighery *et al.* 2000, C. Zwick, pers. comm.). A very successful mapping and control

program has been conducted on the mainland populations, however these will need to be monitored and any regrowth controlled for a number of years. African boxthorn is also known to occur in the proposed Edel Land National Park and Tamala Station, but information is limited about its distribution or extent in this area (C. Zwick, *pers. comm*.).

Landholders, including the Department, are legally responsible for eradicating plants declared under the *Agriculture and Related Resources Protection Act 1976* (ARRP Act), however the *Agriculture Protection Board Act 1950* takes precedence over the ARRP Act to the limit of any inconsistency between the two Acts and preserves the Department's right to decide priorities and the level of control according to resources. These Acts are being replaced by the BAM Act with provisions of this Act being progressively implemented from 1 July 2009. Four plants declared under the ARRP Act occur in the planning area, athel pine, saffron thistle, Paterson's curse and doublegee (Appendix 5).

With funding support from the Commonwealth, a collaborative project between the Shire of Shark Bay, Main Roads WA and the Department has produced a weed register for the planning area. There are ten species rated as 'High' according to the *Environmental Weed Strategy*. They vary in distribution and degree of threat to the biodiversity values of the planning area and have the potential to impact significantly on natural vegetation and fauna habitats. These include ruby dock (*Acetosa vesicaria*), kapok bush (*Aerva javanica*), Mediterranean turnip (*B. tournefortii*), great brome (*Bromus diandrus*), buffel grass (*C. ciliaris*), birdwood grass (*Cenchrus setigerus*), sandplain lupin (*Lupinus cosentinii*), African box-thorn (*L. ferocissimum*), stinking passion flowers (*Passiflora foetida* and *Passiflora foetida var hispida* (see Appendix 5).

The control of environmental weeds in the planning area requires a planned and prioritised approach. Preparation of a prioritised control plan for the planning area is required, which is based on:

- the weed species present;
- the size of the infestation;
- invasiveness and impacts of weed species;
- rehabilitation requirements;
- the existing and potential level of threat of the weed (in particular to specially protected fauna, DRF and priority flora, TECs and other ecosystems of significance);
- preventing the establishment of new weed species;
- the efficiency and effectiveness of control measures;
- location and availability of resources;
- level of participation of stakeholders; and
- the capacity for long-term monitoring of the program;

23 – Environmental Weeds

Key Points

- Weeds can displace indigenous plants, particularly on disturbed sites.
- There are 75 environmental weed species in the planning area. Ten have been rated as high priority weeds.
- Many of the weed species are localised and have been introduced as a by-product of previous land practices, particularly pastoralism.
- There are four declared weeds under the ARRP Act in the planning area; athel pine, saffron thistle, Paterson's curse and doublegee.
- Roadside development and maintenance have the potential to introduce and spread weeds if hygiene practices are not applied.

The objective is to protect the key values of the planning area whilst minimising the impact of environmental weeds.

This will be achieved by:

1. continuing to maintain a register of weeds, including details of distribution, relevant biological information and a history of control measures;
2. regularly surveying locations considered to be susceptible to weed infestation;
3. preparing a weed control program or plan on a priority basis according to the criteria listed above;
4. controlling weeds according to the priority species and priority areas (such as Dirk Hartog Island, South Peron and priority sites such as visitor sites, roads/tracks, bores and old pastoral buildings), as

determined in the weed control program by appropriate methods including mechanical removal, use of appropriate herbicides and by biological methods;
5. applying the Department's proposed Policy Statement, *Environmental Weed Management* (subject to final consultation), and the policy statement for environmental weeds (in preparation);
6. limiting the opportunity for weeds to be introduced and established by minimising disturbance to soil while carrying out management activities, particularly in areas adjacent to sources of weeds;
7. applying appropriate hygiene practices to machinery entering the area to undertake construction or maintenance of roads and tracks;
8. restricting the importation of soil into the planning area to only those sources with strict soil quarantine;
9. liaising with the Department of Agriculture and Food, landholders, the Pastoral Lands Board, local authorities, mining companies and the community regarding weed control within the planning area and in surrounding areas and ensuring weed control is integrated into management agreements or memoranda of understanding with these groups;
10. observing relevant provisions of the BAM Act in the case of plants declared for the Gascoyne region under the Act. Cooperate with the Department of Agriculture and Food's Regional Office to identify and control all declared plants;
11. rehabilitating disturbed areas with indigenous vegetation (using only local seed) in accordance with Department policy;
12. educating visitors, staff, and community individuals and organisations of the impact that weeds can have on the key values of the Shark Bay area; and
13. encouraging research into the effects and control of buffel grass and other weed species.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
23.1 The number and area of high priority weed species at priority sites	23.1 The number and area covered by high priority weed species at priority sites	Every five years.

24. INTRODUCED AND OTHER PROBLEM ANIMALS

Problem animals have potential for serious impact on natural systems and natural values through direct effects such as predation, habitat destruction, competition for food and territory, introduction of disease, and through environmental degradation by selective grazing and accelerating erosion. Problem animals can be either native species that impact on natural or agricultural values or feral animals (introduced species that have become established as wild or naturalised populations).

Introduced and other problem animal species in the planning area are listed in Table 5. The Department aims to achieve sustained strategic management of problem animals in the planning area according to the Department's Policy Statement (proposed) – '*Management of Pest Animals on CALM-managed Lands*'. The Department also has responsibilities for control of declared animals on the lands it manages under sections 39 to 41 of the ARRP Act.

Table 5: Introduced and other problem animals recorded in the planning area

Common Name	Species
Mammals	
Fox[1]	*Vulpes vulpes*
Cat	*Felis catus*
Rabbit[1]	*Oryctolagus cuniculus*
Goat[1]	*Capra hircus*
House mouse	*Mus musculus*
Horse[1]	*Equus caballus*
Sheep	*Ovis aries*
Cattle	*Bos taurus*
Camel	*Camelus dromedarius*
Pig[1]	*Sus scrofa*
Deer	*Cervus axis, C. elaphus* or *Dama dama*

Common Name	Species
Birds	
Senegal turtle-dove	*Streptopelia senegalensis*

[1] Declared species under the ARRP Act (as of November 2004).

A number of techniques are used to control pest animals including shooting, trapping and baiting. The Department undertakes a trapping program for goats on South Peron and Francois Peron National Park which may be expanded to include the reserve additions. Shooting within the planning area is strictly for the control of pest animals and usually occurs only as part of an integrated management program involving all neighbouring property landholders. In the planning area, the Department works closely with some agency and community-based groups on the control of some feral animals and these working relationships will continue to be developed.

Illegal recreational hunting can pose a serious risk to visitor safety and can be detrimental to public health. The recreational hunting of animals using any kind of weapon, such as firearms, bows (long and cross), slings, gidgies or any other device which projects an object, is not generally permitted on lands managed by the Department. However, professional shooters have been used on neighbouring properties and have been licensed to operate on other Department-managed lands in the State. Protocols have been developed to ensure such hunting is conducted in a professional, safe and humane manner. The shooting or trapping of declared vermin and feral species may be authorised, subject to Director General approval, on lands and waters managed by the Department. Hunters must have:

- a licence to carry firearms on lands managed by the Department under the CALM Act and *Firearms Act 1973*; and
- written authorisation allowing the licensee to hunt feral animals on lands managed by the Department.

Within the planning area, written authorisation is given to hunt a variety of feral animals that are declared under the ARRP Act, such as the feral goat, fox and rabbit. However, this is often conditional on a number of other restrictions that consider the protection of the environment and the safety of other visitors.

The control of introduced and problem animals in the planning area requires a planned and prioritised approach. Preparation of a prioritised control plan for each introduced or problem animal is required which is based on:

- the existing and potential impact of the species;
- preventing the establishment of new pest species;
- the efficiency and effectiveness of control measures;
- systematically controlling or eradicating feral animals according to priorities based on threats to natural values;
- location and availability of resources;
- level of participation of stakeholders; and
- the capacity for long-term monitoring of the program;

Red Foxes and Feral Cats

The red fox is a major threat to small to medium sized mammals and ground-nesting birds (EA 1999d, Burbidge and McKenzie 1989). The feral cat is also thought to have been responsible for the extinction of small to medium sized ground dwelling mammals and ground-nesting birds in some parts of the State, such as some islands and in arid areas (Burbidge and McKenzie 1989).

Predation by both the red fox and the feral cat are listed as key threatening processes under the Commonwealth's EPBC Act. Five-year threat abatement plans have been prepared to provide national co-ordination, with the main emphasis on local control programs to ensure recovery of endangered species (DEWHA 2008a and DEWHA 2008b).

The Department initiated the Western Shield program in 1996 in order to control predators such as the red fox and feral cat. The program involves aerial and ground baiting of lands managed by the Department using 1080 poison (sodium monofluoroacetate) baits to (a) enable selected native wildlife populations to recover, and (b) allow the reintroduction of native animals to former habitats once foxes and cats have been controlled. Sodium monofluoroacetate occurs naturally in native Gastrolobium plants in the south-west of Western Australia giving native animals a natural resistance to the poison.

Significant control programs for foxes, cats, goats and rabbits are being implemented on the Peron Peninsula by the Department as part of Project Eden. This program has run since 1994 and has now been incorporated into the State-wide Western Shield program. Of the initial estimated 2500 foxes on the Peninsula, 95% were eradicated as a result of aerial baiting in 1995 (Sims 2006). Since then almost total eradication has been achieved through on-going aerial baiting and the presence of the barrier fence. Aerial baiting and ground control activities since 1995 have significantly reduced the cat population (Sims 2006). However, due to the presence of rabbits and resurgence of small native mammals and reptiles following the removal of foxes, the complete eradication of cats is unlikely in the near future. This will limit the native fauna species that can be introduced onto Peron Peninsula.

A similar program to control foxes, cats and rabbits is being implemented on Heirisson Prong by the Useless Loop Biosphere Community Group and CSIRO. No foxes or rabbits occur on Dirk Hartog Island although feral cats are present. Since there are also no rabbits on the Island, the potential to eradicate cats is high. If cats can be removed, the reconstruction of extant pre-European native fauna may be possible.

Goats

Large populations of feral goats (*Capra hircus*) are common and widespread on the Shark Bay peninsulas (Brown 2001). Goats, along with foxes and cats, are currently the most significant feral animals within the planning area. Goats are responsible for a variety of impacts on native flora and fauna, including competing with native fauna for food, water and shelter, and threatening the survival of native flora through their feeding habits (EA 1999e). The impact of hooves and overgrazing destabilises soils and greatly increases erosion, particularly in coastal cliff areas. In the planning area, goats also spread weeds, destroy cover and habitat for native fauna, impact on the landscape values for visitors to the World Heritage Property (Brown 2001) and compete for fresh water.

Goat control in conservation reserves adjacent to pastoral leases is complicated by the rise of a *de facto* managed goat industry based on sale of unmanaged (feral) goats. Goat control efforts on conservation lands are significantly impeded where land management objectives on adjacent lands are to maintain or promote their numbers, and where there is a lack of effective control measures to prevent them wandering in from adjacent pastoral properties. In 2002, recognition was given to the growing goat industry in that goats were reclassified from 'prohibited' stock to 'authorised' stock under the Land Administration Act Regulations 1998. As a result of this reclassification, the Pastoral Lands Board has developed best practice management guidelines for the industry, which include guidelines pertaining to identification (e.g. ear marking) and boundary fencing to prevent escape of goats onto adjacent lands. However, there is currently no statutory requirement for pastoralists to manage their goats in accordance with the guidelines, and, to prevent their movement onto adjacent lands. The Department will seek to work in collaboration with individual pastoralists and the Pastoral Lands Board of Western Australia to encourage suitable strategies.

Competition and land degradation by unmanaged goats is listed as key threatening processes under the Commonwealth's EPBC Act and a five-year threat abatement plan has been prepared (DEWHA 2008c).

Goats were eradicated from Bernier Island in the 1970s. Since 1990, over 32 000 sheep and feral goats have been removed from Peron Peninsula, resulting in the total removal of sheep and reduction of goats to very low numbers north of the barrier fence. By 2005, goats were removed from Faure Island. As part of Project Eden, goat control is on-going. However, goats are widespread in other parts of the planning area, many of which have not been subjected to strategic control programs. Goat control on former pastoral leases proposed to be added to the conservation estate will be particularly important. Methods used to control goats in the planning area have included trapping at water points, poisoning, fencing, and aerial and ground shooting (Brown 2001). Opportunities exist for community groups and shooting clubs to be involved in goat control programs within the planning area. Feral goat control also occurs on some pastoral leases adjacent to the planning area.

Rabbits

The rabbit is one of the most widely spread and numerous of the introduced mammals in Australia. Competition and land degradation by rabbits is listed as key threatening processes under the Commonwealth's EPBC Act and a five-year threat abatement plan has been prepared (DEWHA 2008c). With the exception of Dirk Hartog Island, rabbits are widespread throughout the planning area. The rabbit calicivirus was also introduced onto the Peron Peninsula in 1996 and again in 1998, with limited effect. The Spanish flea was also introduced to try to promote the disease spread. Although myxomatosis was introduced in 1994 and is well established, rabbit

numbers remain moderately high with regular seasonal fluctuations (Sims 2006). Aerial baiting for rabbit control in part of Francois Peron National Park was undertaken in 2005 with limited success.

Other Introduced and Problem Animals

Camels have been observed around the wetland soaks in Zuytdorp Nature Reserve and nearby areas. House mice are widespread across the planning area. In the past, a specific program was developed to remove rats from Bernier and Dorre Islands. Horses, sheep and cattle are also present, particularly in areas adjoining present or former-pastoral lease areas. Cattle have been eradicated from the Francois Peron National Park, but smaller numbers have been observed in the southern parts of the planning area. There also have been reports of deer being observed in the southern parts of the planning area.

Emus can become a problem animal in some years when numbers build up and conditions in inland areas become dry. The State Barrier Fence on the southern boundary of the planning area is an effective barrier in preventing emus from entering agricultural areas. However, the build up of emus along this fence and their management needs to be monitored.

24 – Introduced and Problem Animals

Key Points

- There are a number of introduced animals in the planning area that can out-compete, prey on, or alter the habitat for native animals. The most significant of these are foxes, cats, goats and rabbits.
- Other introduced species present within the planning area include camels, horses, house mice, rats, deer, sheep and cattle.
- Project Eden plays an important role in the strategic control of foxes, cats, goats and rabbits on Peron Peninsula.
- There are a range of methods that can be used to control introduced and other problem animals including trapping, the use of helicopter-based shooting and baiting.
- Authorised hunting can supplement other forms of control of some introduced and other problem animals.

The objective is to minimise the numbers of introduced animals and, where possible, negate the impacts of problem animals on the key values of the planning area.

This will be achieved by:

1. preparing a priority control plan and program for each introduced animal based on the criteria outlined above;
2. developing a monitoring program to evaluate the effectiveness of this control program in improving biodiversity indicators such as fauna abundance (see Section 21 – *Native Animals*) and vegetation density (see Section 20 – *Native Plants and Vegetation Associations*);
3. controlling problem animals in accordance with the Department policy and operational guidelines;
4. establishing and maintaining a register of all feral animals in the planning area and in adjacent areas. The register is to include details of distribution, relevant biological information, a history of control measures and any information relating to their impact upon native mammals;
5. continuing to undertake appropriate fox, cat, goat and rabbit control as part of Project Eden to protect native fauna, particularly specially protected species, from introduced predators;
6. preventing further introductions of non-native animals in the planning area through appropriate monitoring;
7. continuing to investigate rabbit control options on Peron Peninsula;
8. undertaking trapping, baiting and shooting of pest animals through planned programs with approval of the Director General;
9. encouraging visitors to report sightings of introduced animals especially on Dirk Hartog Island;
10. monitoring islands where introduced animals are not present to ensure they remain free of introduced animals;
11. supporting research into the impacts of introduced predators and herbivores in the planning area;
12. supporting continued research, development and application of effective baits and vectors for control of introduced animals;
13. liaising with landholders, local authorities, and the Department of Agriculture and Food regarding control of problem animals within the planning area and the surrounding lands, and including emus along the barrier fence;

14. not permitting domestic animals in the Francois Peron National Park, Dirk Hartog Island National Park and proposed Edel Land National Park, with the exception of guide dogs and dogs associated with search and rescue operations (see Section 36 – *Domestic Animals*); and
15. within the planning area, only permitting domestic animals in designated areas of Shell Beach Conservation Park and proposed South Peron (yet to be named) Conservation Park (see Section 36 – *Domestic Animals*).

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
24.1 Number or number of populations of feral foxes and cats.	24.1 A decrease in the number or number of populations of feral foxes and cats.	Every five years.
24.2 Number of feral goats on Dirk Hartog Island and Peron Peninsula.	24.2 Complete eradication of goats on Dirk Hartog Island and Peron Peninsula within the life of the plan.	Every five years
24.3 Number of feral cats on Dirk Hartog Island.	24.3 Complete eradication of cats from Dirk Hartog Island within the life of the plan.	Every five years
24.4 Number of introduced animals on Bernier & Dorre islands.	24.4 Absence of introduced animals on Bernier & Dorre islands.	Every five years

25. DISEASES

Plant Diseases

No serious diseases that effect native plants are known to exist in Shark Bay. Western Australia's most damaging plant disease, *Phytophthora* dieback, is an introduced fungus of tropical origin with eight species or varieties but has limited distribution in the northern sandplains. The heath vegetation of Zuytdorp Nature Reserve and neighbouring areas might be susceptible to dieback, though the risk is very low as the soils of the area are generally too dry to sustain the disease and vehicle access is limited.

Animal Diseases

Diseases in native animals can be a major contributing factor to poor population health, reduced fertility and local extinctions. Under the *Animal Welfare Act 2002* (Animal Welfare Act), proposals by the Department involving the care and use of animals for scientific purposes must be referred to the Animal Ethics Committee for approval. The Department's Administrative Instruction No. 67 refers to requirements under the Animal Welfare Act and the Animal Ethics Committee. The Department's Administrative Instruction No. 67 *Minimising Disease Risk in Wildlife Management Standard Operating Procedures* gives general guidelines and standard operating procedures for reducing the risk of disease transmission in field practice (CALM 2005a).

Mammals and Birds

An ocular disease or conjunctivitis in the western barred bandicoot was first noted in captive bred animals in October 2000 (CALM 2002). These animals displayed various symptoms including corneal opacity, conjunctivitis, ocular discharge, swollen eyelids and ruptured eyeballs (CALM 2002). These symptoms, were recorded from both captive animals and wild individuals of this and other threatened mammals on Bernier and Dorre Islands, and were associated with the identification of a novel chlamydials. Chlamydiasis found in koalas, can lead to blindness and infertility. An experimental treatment was implemented and, although requiring daily treatment, was very successful with all affected eyes returning to normal. 'Chlamydia', an intracellular bacterial organism, (2 separate genuses, with up to 9 different species identified to date) can infect multiple species of native mammals and humans (CALM 2002).

A wart-like growth disease has also been identified in western barred bandicoots and is currently without effective treatment. This cutaneous papillomatosis and carcinomatosis is clinically expressed as wart-like lesions on feet, around eyes, pouch, cloaca and ears particularly, but can occur anywhere on the body (CALM 2002). The wart-like lesions proliferate and the animals become increasingly debilitated and in many cases, older lesions develop into squamous cell carcinomas, resulting in death or euthanasia of animals. The causative

organism has been identified as a virus with characteristics of a papilloma/polyoma type, which may prove to be a new virus with combined features of both groups. No treatment is currently available (CALM 2002).

Recent studies on the wild western barred bandicoot populations on Bernier and Dorre islands have identified ticks from this species carrying the bacteria *Coxiella burnetii* which causes the disease Q fever in humans. Q fever causes a febrile disease and pneumonia in humans and has been associated with abortion in species such as cats, cattle, sheep and goats which are all common domestic reservoirs. It is known that bandicoots and other wildlife species can also act as a reservoir for this organism, but not what, if any disease it causes in these species. This organism can be transmitted by inhalation of infected aerosols and via tick bites. It has the potential to pose a health risk to all mammal species on the islands (probably low risk) and has significance as a potential zoonosis for visitors and researchers. It is possible that the presence of this pathogen is a legacy of the past presence of stock and humans on the islands.

The discovery of symptoms of these two clinical diseases in both wild and captive populations of the western barred bandicoot (as well as the multi-species pathogen present in this species' ectoparasites on the islands) has caused concern in relation to the proposed translocation of this and other mammal species, and the well-being of the two surviving natural island populations of this species. The possibility that pathogens may be transported with animals and trapping equipment or transferred direct to other species, needs to be addressed in planning captive breeding, fauna trapping and translocations programs, and in future research.

There is a requirement for establishing appropriate hygiene and quarantine protocols for working with mammals that are part of a research, breeding and translocation program. Different levels of protocols are required according to the level of concern for a particular species. Translocations are covered by stringent guidelines that address hygiene requirements. Routine trapping for research and monitoring involves lower levels of risk and guidelines should be designed appropriately. However, small isolated and island populations of threatened fauna are at particular risk due to a lack of exposure to common pathogens and potentially reduced genetic diversity and immune function, and thus require stringent quarantine protocols to be maintained. Staff and carers handling wildlife can also be at risk of being exposed to animal diseases.

Migratory birds occupy Shark Bay for periods of the year. As such there is the potential, although limited, for avian influenza to be introduced into the area.

Reptiles

Marine turtle fibropapillomatosis (FP) is a debilitating neoplastic disease of marine turtles of recent pandemic proportions, which is found in all major oceans and is commonly linked to heavily polluted coastal areas. The incidence and distribution of this disease increased sharply in the 1980s and has been documented not only in green turtles but also in all other marine turtle species. The ultimate causative agent or agents for the tumours and risk factors remain unknown (Aguirre and Lutz 2004). The main differences in prevalence can possibly be the consequence of various factors, such as, population density, presence of potential vectors, water temperature, genetic susceptibility, degrees of coastal pollution and stress.

It is very important to carefully plan and manage turtle conservation and tagging programs. The disinfection of tagging instruments and other equipment surfaces is critical, as a potential viral agent may be spread unintentionally by researches from one turtle to the other (Curry *et al.* 2000). Balazs *et al.* (2000) noticed that tumour growth was enhanced at the piercing site of the tags commonly used to identify the individuals and recommended using only microchips, especially in diseased animals.

Fibropapillomatosis is a severely debilitating disease and can potentially have a devastating impact on the endangered sea turtle population around the world. Although the aetiology as well as other aspects of the pathogenesis are still under study it seems clear that this disease is linked to "anthropogenic degradation of the environmental health" (Aguirre and Lutz 2004). Landsberg *et al.* (1999) suggested that a "tumour promoter" (e.g. a biotoxin) possibly operates in conjunction with a "tumour initiator" (e.g. a virus).

Amphibians

Chytridiomycosis is an infectious disease affecting amphibians worldwide and caused by the amphibian chytrid fungus *Batrachochytrium dendrobatidis*. This is a highly virulent fungal pathogen capable at the minimum of causing sporadic deaths in some frog populations and 100% mortality in other populations (DEH 2002). Frogs probably catch the fungus through direct contact with another infected animal, or from infected water (DEH 2002). *Chytridiomycosis* disease is listed as key threatening process under the Commonwealth's EPBC Act and

a five-year threat abatement plan has been prepared (DEWHA 2008d). In the Shark Bay area, because of the drier conditions it is highly unlikely that burrowing amphibians found will be affected by the disease.

25 – Diseases

Key Points:

- There is a low risk of soil borne plant pathogens establishing and sustaining in the area because of dry soil and climatic conditions.
- Diseases in wildlife can be a major contributing factor to poor population health, reduced fertility and local extinctions.
- The possibility that pathogens may be transported with animals and trapping equipment or transferred direct to other species needs to be addressed in planning captive breeding, fauna trapping and translocations programs, and in future research.
- Compliance with the Department's Administrative Instruction No. 67 *Minimising Disease Risk in Wildlife Management Standard Operating Procedures* and requirements under the Animal Welfare Act and the Animal Ethics Committee is necessary for the care and use of animals for scientific purposes.

The objective is to prevent the introduction and minimise the spread of plant and animal diseases in the planning area.

This will be achieved by:

1. monitoring plant communities and animal populations to determine whether they are infected with disease;
2. developing and implementing pro-active disease screening programs for native fauna appropriate to the species and its conservation status, in order to establish endemic levels of disease;
3. as necessary, applying appropriate hygiene and quarantine protocols for working with mammals that are part of a research, breeding and translocation program;
4. supporting further research into the distribution, epidemiology, species susceptibility and ecological impacts of animal disease on fauna in the planning area;
5. as necessary, adapting management in response to new knowledge and understanding of animal diseases and its impact on biodiversity; and
6. providing visitor information to interpret the introduction and spread of plant and animal diseases in the planning area.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
25.1 Response to signs of unusual changes in clinical disease, lowered reproduction, increased mortality and/or population decline of threatened fauna with intensive disease/pathogen screening and appropriate quarantine and protection measures.	25.1 A rapid response to signs of unusual changes in clinical disease, lowered reproduction, increased mortality and/or population decline of threatened fauna with intensive disease/pathogen screening and appropriate quarantine and protection measures.	Annually

26. FIRE

Fire is an ancient process essential to the conservation of biodiversity, yet it is also a phenomenon capable of threatening biodiversity, life and community assets. As a result, fire management is integral to the Department's activities and a core management responsibility. The challenge for managers is to devise practical and affordable fire regimes that conserve biodiversity at agreed spatial scales and minimise the adverse impact of bushfires on key values.

The Department's State-wide role in fire protection is regulated by legislation (the Bush Fires Act, CALM Act and precedents established under common law). Part IV of the Bush Fires Act specifies that responsibility for controlling and extinguishing bush fires lies with local government authorities and the bush fire control officers appointed by them. Management of bush fires is also guided by the Department's Policy Statement 19 – *Fire Management*, and 16 management principles for fire management in spinifex grasslands in Western Australia (Burrows 2004b, Friend 1999). These principles are stated in Appendix 6 and were developed to guide fire

management in the spinifex grasslands of the Kimberley, Pilbara and inland areas of Western Australia. Given the presence of spinifex on Bernier, Dorre and Koks islands, parts of Peron Peninsula, Zuytdorp Nature Reserve, Dirk Hartog Island and Edel Land, some of these principles may be applicable to the planning area.

This management plan presents an adaptive management approach to fire where management policies and practices are continually improved by learning from the outcomes of operational programs, scientific research and monitoring. This acknowledges a level of uncertainty about what policy and practices are best and the best available knowledge is utilised to implement programs aimed at meeting specific management objectives. Monitoring, regular review, analysis of management outcomes and ongoing research are critical if fire management in the planning area is to continuously improve.

Fire History

There is only limited documentation of the fire history of the planning area. Aerial photography and satellite imagery provide evidence of numerous small fires in the last 50 years around Shark Bay. In recent years some fires have resulted from human activities. Appropriate management of fire is essential, since some fire regimes can degrade the key values of the planning area.

Indigenous use of fire

For millennia, fire has been both a natural phenomenon through lightning strikes and applied practice in Australia.

Fire was used regularly and purposefully across the landscape by Indigenous people for many purposes (Nicholson 1981, Burrows and Christensen 1991, Haynes 1991, Pyne 1991, Latz 1994, Burrows *et al.* 2000). Such studies suggest Indigenous people used fire to improve hunting and foraging opportunities, to encourage economically important recolonising species, to "clean up the country" by removing dead or senescent vegetation, to communicate and for ceremonial purposes.

The ecological effects and patterns resulting from traditional Aboriginal burning have not been documented for the Shark Bay area. Limited experimental information on the ecological impacts of traditional burning in similar landscapes is available (Tropical Savannas CRC 1997).

It is thought that the cessation of traditional burning has created substantial changes to the landscape across Australia, particularly to the range and structure of vegetation types. However, much of this evidence is anecdotal and based on observations following the end of Aboriginal burning after European colonisation.

Fire management following settlement

The arrival of pastoralism, together with the departure of Aboriginal people from their homelands, has resulted in considerable changes to the burning patterns and fire regimes of arid areas. While it is likely that some traditional burning techniques were incorporated into pastoral burning, the pattern of fire associated with traditional routes for travelling through the country is likely to have changed. In arid areas today, a regime of large and intense bushfires has replaced a regime of regular patch-burning in some areas. This altered fire regime, together with introduced predators and herbivores, has contributed to the alarming decline of arid zone mammals and some plant communities as well as having an adverse impact upon other biodiversity values in general in these areas.

Three major fires have been recorded on Dorre Island – in 1860, July 1909 and September 1973. Each of these fires resulted from human use and burnt much of the island's vegetation. There is no evidence of any major fires on Bernier Island in the last 100 years, though charred stumps on the north end of the island indicate that small fires have probably occurred as a result of lightning strikes. Larger island nature reserves such as Salutation, Baudin and Three Bays islands support vegetation types that could burn, but there is no evidence of fire occurring. Many of the other smaller islands are sparsely vegetated and would not carry a fire.

Anecdotal evidence from long-term local Denham residents suggests a fire in the 1950s burnt the entire Peron Peninsula and the presence of charcoal support this. Aerial photography shows where pastoralists lit fires off the edge of tracks in Peron Peninsula, although these were small and did not burn far from the tracks. There is also evidence of fires in the north of the Francois Peron National Park which appear to have been caused by human activities. There have also been small fires on parts of Tamala and Nanga pastoral leases. The fire history of other parts of the planning area such as the Zuytdorp area, Edel Land and Dirk Hartog Island, is yet to be documented.
The incidence of fire under pastoral management is likely to have been significantly different from what it was

prior to settlement. Grazing may have significantly changed the original vegetation and fuel structure from grasses and low and tall shrubs to limited low shrubs and fewer grasses resulting in the landscape being less flammable, as stock consumed the fuel required by fire. The area was very heavily stocked in the past. In more recent times, management of the Peninsula for conservation, the associated removal of sheep and the control of goats may have caused the fuel structures to change again. This may be a significant factor to consider in determining the risks associated with fire and the strategies that might be adopted to manage both prescribed fire and bushfire.

Prescribed burning and scrub rolling was conducted on Peron Peninsula to establish strategic buffers in the mid 1990s.

The introduction of buffel grass (*C. ciliaris*) as a dominant pasture species also effected a change to natural fire regimes. It is likely that under pastoralism, areas of hummock spinifex grasslands, as occurs over parts of the Shark Bay area, were burnt on a regular basis both to encourage the spread of buffel and to promote the growth of younger, more palatable native plants. In addition, buffel grass was introduced by the former Department of Agriculture to the southern end of the Peron Peninsula to stabilise overgrazed areas of destabilised soil.

The presence of buffel grass particularly on parts of South Peron and Dirk Hartog Island creates the ideal fuel source for bushfire—it burns readily, even when green, rapidly regenerates after fire (Tu 2002), and is capable of encouraging and carrying bushfires through other vegetation communities that are not adapted to fire. Buffel grass is allelopathic (leaches chemicals that suppress the seedlings of other species) assisting it to establish and spread after fire. Regular bushfires maintain buffel grass populations, while suppressing or replacing native species, resulting in a change in vegetation structure and a reduction in species diversity (Dixon *et al.* 2001). The presence of other weeds may also have changed the flammability and the spatial arrangement of that flammability (more uniform).

Fire Environment

Fires within the Shark Bay area are strongly influenced by the climate of the area, which is characterised by hot dry summers and mild winters. Average maximum temperatures during summer peak at 31.8°C. The average annual rainfall is low, particularly during the summer (ranging from 1.3mm in December and 14.7mm in February), although occasionally, there is rain from cyclones during the summer. However, these do not add a large amount of rain to the annual average. The annual evaporation rate ranges from 3000mm in the east to 2000mm in the west. Shark Bay is influenced by the south-east trade winds which generate southerly winds for most of the year. During summer at Denham, southerlies commonly blow consistently for several days at over 25kmh with maximum gusts up to 80kmh. There are periodic summer/autumn cyclones which generate winds with gusts up to 260kmh.

There is a range of vegetation types within Shark Bay (see Section 20 – *Native Plants and Vegetation Associations*) and there is only a limited understanding of how fire behaves within each of these. Fires in the Shark Bay area are generally infrequent. The risk of ignition from lightning is low, as is the ability for the vegetation to carry and sustain a fire. Shrubland vegetation communities are common and, for fire to spread in this vegetation type, weather thresholds, particularly wind speed, need to be exceeded. Under sub-threshold weather conditions, fire will be reluctant to spread. Likewise fire within spinifex communities is closely related to weather conditions and the growth of spinifex itself. Following periods of low rainfall and subsequent low spinifex growth, fires are not common, even during extreme weather conditions.

In contrast, on days of extreme fire weather, fires have the potential to spread rapidly in shrubland vegetation. In spinifex communities fire behaviour intensifies following periods of high rainfall and high growth when mature spinifex plants dry out. Under these conditions, fire behaviour is particularly sensitive to wind speed, direction and fuel moisture content. When fire weather conditions are very severe and particularly hot and windy (generally during the summer), there is the potential for severe fires within the planning area that may burn over very large areas. However, these conditions are not common and fires are mostly a rare occurrence in Shark Bay.

Fire Ecology

Fire ecology is the study of the interaction of fire, the biota (plant and animal species), and the habitats in which they live. Knowledge of the impacts of this interaction is integral in protecting biodiversity, but also life and community assets. While numerous studies report the changing species assemblages, species diversity, vegetation composition and structure, and habitat characteristics in response to time since last fire, fire season,

fire interval, or fire intensity, and on the ways in which fire can influence ecosystem processes such as nutrient cycling, not enough is known about fire ecology in the Shark Bay area and fire management will continue to evolve with accumulated knowledge and management experience (Burrows 2004b).

Adaptation of Biota to Fire

Adaptations of biota are often useful in dealing with the impacts of periodic drought, the poor nutrient status of many Australian environments and of fire. These adaptations contribute to the 'life history strategies' that biota have employed to adapt to fire. These adaptive attributes are sometime referred to as 'vital attributes'.

Vital attributes provide valuable clues to understanding what might be the most appropriate fire regime for that species. A fire regime is a description of fire in terms of its: periodicity (how often it occurs on a site); intensity (how hot it is); season (what time of year it occurs); scale (how big it is); and its spatial diversity (how patchy it is at both a landscape and local scale). Determining vital attributes of species will enable fire regimes to be determined that ensure their conservation. Biological indicators and other vital attributes of the biota can be used to help determine historic fire regimes. However, no single fire regime is optimal for all species and while many species are resilient to a range of fire regimes, some species are vulnerable or sensitive to fire or have quite specific fire regime requirements (also known as 'key fire response' species).

Unfortunately there is also little information about the adaptation of biota to fire in the Shark Bay area. Biota located on the islands and peninsulas is exposed to maritime influences such as high moisture levels, cool winds and salt laden air. As such, the risk of ignition from lightning and the ability for an area to carry and sustain a fire is also low.

To date, there has been limited research conducted on determining the vital attributes of specific flora and fauna species within the planning area. Given the low likelihood and impact of fire in the Shark Bay area, the following discussion provides a simple explanation of the importance of these features in understanding fire in the Shark Bay landscape. Hence, the key focus of the management plan will be research into the vital attributes of flora, fauna and vegetation communities, fire sensitive species, threatened species and specific ecological communities and the impacts of fire on these. There is also a need to investigate the properties of the various shrubland vegetation communities as fuel – its post-fire dynamics (biomass and structure) and how fire behaves under various weather conditions in these vegetation types.

Vital Attributes of the Fauna

Research across the State indicates that the immediate impact of fire on fauna and their recovery rate is directly proportional to the scale, intensity, and patchiness of the fire and the interval between fires (Friend 1995, Burrows and Friend 1998, Friend 1999, Burbidge 2003, Friend and Wayne 2003). This response will also depend on the presence of predators where displaced species have to travel across open ground to find suitable habitat (Friend 1999).

No research on the impacts of fire on mammals in the planning area has been carried out. However, research carried out elsewhere in arid and semi-arid environments can provide some indication as to the likely responses of fauna to fire. For mammals at least, the post-fire response of fauna populations is reasonably predictable and consistent and could be considered in terms of their life history characteristics based on shelter, food and breeding requirements, and the scale, intensity and patchiness of the fire (Burrows *et al*. 1999, Friend 1999). Responses by fauna are largely dependent on vegetation structure and floristic composition, which simplifies the prediction of fire impacts (Friend 1999, Friend and Wayne 2003, Burbidge 2003, Bamford and Roberts 2003). Attracted by the new growth, populations of larger macropods such as Western grey kangaroos increase dramatically in the first few years following fire, then slowly decline. The rufous hare wallaby, a species found in the planning area, prefers early post-fire succession spinifex habitat, due to the higher nutritional value and digestibility of regrowth spinifex. However, it also prefers dense spinifex for movement and daytime shelter and more open areas for feeding. Consequently, a diversity of fire regimes is important for creating the diversity of habitat required by this species (Burbidge and Johnson 1983, Lundie-Jenkins, 1993, Lundie-Jenkins et al 1993). The response of small mammal species to fire can be highly varied. For example, research carried out in spinifex grasslands in central Australia showed that *Pseudomys hermannsburgensis* (found in the planning area) are more abundant in older vegetation (11-15 years) whereas *Notomys alexis* (also found in the planning area) is more abundant in one to four year old vegetation.

The impact of fire on birds is difficult to predict as different species respond differently (Burbidge 2003). Likewise no research on the response of birds to fire in the planning area has been carried out. In other parts of Australia, fire intensity has been found to affect mortality rates and alter the vegetation structure. High intensity

fires can result in high mortality rates and have considerable impacts on the structure of vegetation and subsequent numbers of birds. Changes in the availability of food and reduced cover can result in declines in bird numbers following fire (Recher *et al* 1985). Conversely, research on the impact of fire on birds in savannah woodland in northern Australia found only limited long-term changes in bird populations following fire and an increase in the diversity and density of birds that feed in the scrubby understorey as it changed from predominantly grasses to shrubs after fire (Woinarski 1990). While it is well recognised that malleefowl (*Leipoa ocellata*) require relatively large areas that are long unburnt for nesting material, food resources and cover, the spatial and temporal role of fire in maintaining, regenerating and protecting mallee fowl habitat is poorly understood.

Research in other arid and semi-arid regions of Australia has consistently shown that fire is an important factor for many reptile communities (e.g. Braithwaite 1987, Trainor and Woinarski 1994, Masters 1996). For example, work in spinifex grasslands suggests that fire mosaics maximise reptile diversity (Masters 1996). Although most reptile species were caught in mature spinifex, regenerating areas act as fire breaks and ensure that mature spinifex is always present. Research in Kakadu National Park investigated the response of lizards to fire (Trainor and Woinarski 1994). One species decreased in abundance following fire, whereas two species were found to be more abundant in burnt areas, compared with unburnt areas and differences were attributed to differences in vegetation structure. As with other fauna, fire that creates a habitat mosaic is important for the maintenance of reptile species diversity. The interval between fires, the number of fires and the scale and patchiness of fires has been shown to be important in determining the structure of the habitat, which in turn determines the composition of reptile species. Only limited research has been conducted on the response of amphibians to fire. Bamford (1992) found the abundance of *Myobatrachus gouldii* (found in the planning area) was greatest in areas long unburnt, although he suggested that frogs appear to be influenced more by proximity to water than by time since fire.

These results indicate that further research is required to better understand the response of fauna to fire in the planning area.

Vital Attributes of the Flora

The vital attributes of flora can include:

- the time taken for plant species to flower and set seed after germination;
- the time to senescence and death;
- how a plant regenerates following fire (from seed, re-sprouting or both);
- where the seed is stored (in the canopy, in the soil or both);
- how this seed is triggered to germinate; and
- the role of fire in recruitment of plant populations.

In other parts of the State, using knowledge of the vital attributes of plants has helped to define fire regimes, especially minimum and maximum intervals between fires. Plants are the primary producers in natural ecosystems and almost all other life forms depend on them. The rate at which plant species produce adequate seed for regeneration after fire is an important consideration in determining the minimum inter-fire period. The longevity of plant species (particularly fire sensitive obligate seeding species that hold seed on the plant) helps define the maximum safe interval between fires before the seed bank is lost.

On the basis of current knowledge, doubling the juvenile period[8] of the slowest maturing fire sensitive species at a particular site generally provides a conservative minimum interval between lethal intensity fires and allows for adequate replenishment of seed banks (Burrows and Wardell-Johnson 2003). Populations will survive more frequent fires provided the intensity of the fire does not kill the entire cohort of parent plants.

As with fauna, there is little knowledge about the vital attributes of the flora of the planning area and its response to fire. Therefore, it is difficult to define the most appropriate intervals between fires for various flora species within the planning area. The management plan will therefore focus on improving understanding about the vital attributes of the flora. Conducting experimental burning within the planning area may also assist in providing more understanding about the development of appropriate fire regimes.

[8] The juvenile period is defined as the time it takes for at least 50% of the population to reach flowering age.

Vegetation Communities

Following intense fire coastal dune and heath vegetation is vulnerable to wind erosion. While dune systems are generally well adapted to fire and rehabilitate quickly, careful application of fire and protection from bushfire is required to ensure erosion does not occur.

The spinifex vegetation communities found in various parts of the planning area will normally only carry a fire after a return period of about 5-7 years although studies (Burrows *et al.* 1991) in spinifex communities in the Gibson Desert showed that this interval can be shorter under severe fire conditions or following high growth periods associated with seasons of above average rainfall. When mature and dry, spinifex will burn under most weather conditions but fire behaviour is particularly sensitive to wind speed and direction, and to fuel moisture content. Empirically-derived fire behaviour models have been developed for hummock grasslands (Burrows *et al.* 2006).

Much of the Shark Bay region is dominated by shrubland vegetation communities. For fire to spread in this vegetation type, weather thresholds and particularly wind speed need to be exceeded. Under sub-threshold weather conditions, fire will be reluctant to spread but once thresholds are exceeded, fires have the potential to spread rapidly. This presents difficulties for both prescribed burning and bushfire control. In other regions of the State, prescribed burning in shrublands especially buffer burning to restrict bushfire spread is often facilitated by mechanical alteration of the vegetation such as scrub rolling to provide a safer range of weather conditions to undertake prescribed burning. However, this technique needs to be implemented under carefully prescribed conditions to avoid loss or damage to seed banks and leading to failed regeneration.

Climate change is also likely to have implications for fire management within the Shark Bay area. Changes in ground moisture, temperatures, wind conditions and vegetation may lead to more frequent extreme 'fire weather' conditions, vigorous fire behaviour in traditionally cooler months and more restricted burning seasons for implementing prescribed fire regimes (Howden *et al.* 2003). In Northern Australia, current predictions suggest the frequency of floods and droughts could increase, with some areas becoming more arid. Given the location of Shark Bay in a transition zone in relation to vegetation and climate, the impacts of climate change on fire management in the planning area are even more uncertain (Bushfire Cooperative Research Centre and Australasian Fire Authorities Council 2006).

Fire Management within the Planning Area

The objective of the Department is to manage fire on lands managed by the Department to protect and promote the conservation of biodiversity and natural values whilst also providing for protection of human life and community assets. However, due to the limited knowledge of fire ecology and fire behaviour in ecosystems in the Shark Bay area, the primary objectives of fire over the life of this plan will be to:

- advance knowledge of fire ecology and fire behaviour through targeted research and operational experience in an adaptive management framework that includes monitoring; and
- reduce the risk of large and damaging bushfires by undertaking strategic fuel reduction and modification.

Within the planning area, the Department is also responsible for the development and implementation of fire pre-suppression strategies on conservation estate, unallocated Crown lands and unmanaged Crown reserves proposed for addition to the planning area. Local government remains responsible for fire suppression activities on private land and pastoral leases surrounding the planning area.

Managing Fire to Conserve Biodiversity

Fire Research

In the Shark Bay area, maintaining fire in the landscape at appropriate temporal and spatial scales is fundamental to successful conservation and land management. The issue of the most appropriate scales at which to manage fire is a complex one and there will always be a trade-off between what is ecologically desirable, based on best available knowledge, and what is feasible and practical. It is generally accepted that a mosaic of vegetation age classes (seral stages) benefits biodiversity and reduces the adverse impacts of bushfires. However, there is uncertainty about the most ecologically appropriate fire regimes (fire interval, season, scale and patchiness) to apply to the major ecosystems in the area in order to deliver biodiversity outcomes and prevent large, damaging bushfires. Therefore, a program of fire research and adaptive management will be planned and implemented to increase knowledge to support appropriate fire management in the future.

The development of a fire research plan for the planning area is proposed and priorities will include:

- developing an understanding of fuel dynamics and fire behaviour in shrubland vegetation communities to enable the planning and safe implementation of prescribed burning programs to achieve conservation and community protection outcomes;
- documenting the fire response and vital attributes of threatened, keystone and focal species to assist with understanding fire regime parameters;
- investigating community-level responses to fire events in shrublands and hummock grassland vegetation communities; and
- investigating interactions between fire and other factors, especially weeds and herbivory.

Adaptive Fire Management

The scientific complexity of fire behaviour and ecology means there will continue to be uncertainty surrounding ecosystem responses to fire (planned and unplanned) and the outcomes of various planned fire regimes. Fire managers recognise this uncertainty but also understand that it is not a valid reason to avoid taking action to protect biodiversity, life and community assets from inappropriate fire regimes. Pro-actively applying prescribed fire in managed ways can achieve many benefits for biodiversity that outweigh the risk of uncertainty and can also contribute to the better understanding of ecosystems over time. To maximise learning opportunities, targeted prescribed burning for biodiversity will be carried out in an adaptive management framework. Adaptive management is a process for implementing management policies as an ongoing activity that requires monitoring, learning and adjustment. Adaptive management applies scientific principles and methods to improve management as managers learn from experience and as new research findings emerge. Steps in the adaptive management process include (Burrows 2005):

- assessing the problem and determining the management objectives;
- devising possible solutions, or strategies, which, in the absence of knowledge, may amount to hypotheses to be tested;
- designing the project and the works plan, preparing the burn prescriptions;
- implementing the plan;
- monitoring the responses in relation to the objectives; and
- evaluating the data and adjusting policies and practices if necessary.

Adaptive fire management programs aimed at advancing knowledge and conserving biodiversity will focus on identifying specific areas in which to implement a series of operational scale patch burn trials in an adaptive management framework (see above) in shrubland and hummock grassland communities.

The vital attributes of key fire sensitive flora and fauna species can be used to estimate the range of desirable seral states (i.e. the time since the last fire) and fire frequencies in the landscape. However, there is limited knowledge of biological values and vital attributes of many species in the planning area and therefore, this management plan aims to improve this knowledge.

In the long term and once better information on biological indicators and vital attributes has been obtained, fire management in the planning area will seek to devise, implement and monitor a range of fire regimes based on:

- vital attributes of threatened species and ecological communities;
- vital attributes of key fire response species;
- creating and maintaining diverse post-fire (seral) stages, or functional habitat types; and
- fuel accumulation rates.

Threatened flora, fauna and ecological communities are protected by State and Commonwealth legislation, which imposes requirements in relation to how fire management activities are conducted. The planning area contains many threatened species but no threatened ecological communities, although there are some ‘ecosystems at risk’ (see Table 4). Generally, there is limited fire ecology information for threatened species and other significant species and ecosystems in Shark Bay. Consequently, research and monitoring should be a priority and some carefully monitored experimental burning will be considered. For the planning area, protection of threatened species and ‘ecosystems at risk’ will take priority when devising fire regimes to conserve biodiversity. However, there are potential drawbacks in developing fire management based on single species ecology, so this approach needs to be closely evaluated and monitored for possible adverse impacts on other species and communities.

Across the State, knowledge of the vital attributes of selected plants (key fire response species) within ecosystems is being increasingly used to derive appropriate fire regimes, especially acceptable intervals between fires. Knowledge of the juvenile period, longevity, dispersal capacity, regeneration and establishment requirements of these taxa are used to establish the minimum and maximum fire intervals and regeneration requirements to determine season, spatial scale and intensity of fire. Across the planning area, there is limited knowledge of key response species. Therefore, further research is required to identify key fire response species and their response to fire. Experimental prescribed burning will be used to gather information about the response of various species to fire.

Maintaining a diversity of post-fire fuel ages, seral stages or habitats through space and time, is fundamentally important for ecosystem health, and enhances biodiversity. The process of post-fire vegetation change is continuous, and the rate of change will depend on the severity of disturbance events, such as fire, and local soil and climatic conditions. At least three broad post-fire seral stages can be recognised – early, intermediate and late – based on the rate of change of the understorey vegetation structure and floristics. The transition from one seral stage to the next is somewhat arbitrary, but is based on the vital attributes of species and can be estimated using the juvenile period of the slowest maturing fire sensitive plant species within the major vegetation type (Burrows *et al.* in press). Since knowledge of vital attributes for flora and fauna in the planning area is limited, determining appropriate seral stages is difficult. Therefore researching into biological values and vital attributes is required before seral stages can be determined.

As part of the diversity of fire regimes, some parts of the planning area will not be burnt by prescribed fire during the life of the plan. Bernier and Dorre islands provide habitat for a range of threatened mammal species, some of which are not found on the mainland (see Section 21 – *Native Animals*). In order to maintain suitable habitat for these species and to reduce the risk of mortality due to fire, no prescribed burns will be carried out on these islands. However, habitat condition and the population and abundance of threatened taxa will be closely monitored.

Specific fire management strategies for the Shark Bay planning area will include:

- identifying community assets and developing strategies to protect them;
- facilitating and supporting fire research programs, particularly those that will provide improved knowledge of vital attributes and fire sensitive species;
- mitigating bushfire threats to life, property and natural, cultural and recreation values using experimental prescribed burns;
- investigating appropriate methods of providing strategic fire protection, which may include fuel reduced buffers, edge burning, patch burning and provision of strategic fire access tracks;
- investigating the use of habitat management burns once there is an improved understanding of vital attributes and fire sensitive species;
- minimising the risk of human induced bushfire by prohibiting open/wood fires;
- facilitating early detection of fire through liaison with the local community and relevant agencies; and
- developing mutual aid assistance plans with neighbouring landholders.

Planning for prescribed burns (see *Prescribed Burning and Bushfire Suppression*) will incorporate the need for improving understanding about fire ecology in the planning area, biodiversity conservation and providing strategic protection from bushfires, at landscape, vegetation complex and habitat scales. The planning and application of fire regimes will require consideration of interacting factors such as invasive species (environmental weeds and introduced animals), regeneration of native species, grazing impacts, fire history, and the size of the conservation reserve and habitat scales.

Managing Fire to Protect Life and Community Assets

The existence of towns and settlements and associated infrastructure, pastoral properties and other developments such as mines, as well as the increasing use of natural areas for recreation, requires that the protection of life and community assets be an important consideration for fire management in the planning area.

Identifying community assets within the planning area vulnerable to fire and determining the risk, likelihood and consequences of bushfire to these will assist in managing the threat posed by high intensity bushfires. The Department's bushfire risk analysis[9] provides a systematic framework for this to occur and the basis for a more

[9] The bushfire risk analysis is consistent with the accepted framework under which risk assessments are implemented in Australia – the *Australian/New Zealand Standard AS/NZS 4360:2004 – Risk Management.* Variables in the analysis procedure, such as fuel age, may

detailed analysis and evaluation of susceptible areas and specific fire pre-suppression tactics. However, although a full bushfire risk analysis may not be required for the entire planning area, the structured approach can assist in developing appropriate fire management strategies to mitigate the risk to community and biodiversity values. Some elements of the bushfire risk analysis such as potential source of ignition (through undertaking a fire history analysis), potential behaviour of fire, analysis of fire response capacity and identification of key values provide valuable information for fire planning and suppression.

Mechanical Fuel Management

Mechanical fuel management includes the use of slash breaks[10]. Slash breaks can be applied to restrict a bushfire and/or enable access for fire-fighting machinery and are most often applied in asset and strategic protection. The visual impacts of slashed breaks will be minimised wherever possible using landscape management techniques (e.g. retaining selected trees around ridgelines, manipulating shrub height or alternating their alignment). Should other forms of mechanical fuel management become available in the future, they will be investigated for their application and use within the planning area.

Education, Liaison and Community Involvement

Engaging with the public is vital to improve their understanding of the role and effects of fire, the application of planned fire and fire suppression operations. There is interest in the community about the planning process and outcomes associated with prescribed fire management. Consequently, the Department has made, and will continue to make, its planned burn programs publicly available.

Fires do not respect tenure boundaries and much of the planning area has an interface with pastoral leases and settlements. Therefore, in the successful management of fire, and many other land management issues, fostering 'good neighbour' relations with adjoining landowners, is important, particularly to ensure complementary fire management on adjoining lands. Engagement with local government, volunteer bush fire brigades, Fire and Emergency Services Authority (FESA) and other State government agencies will be necessary to ensure effective fire management across all jurisdictions. Fire management in the planning area will, as far as practicable, be integrated with fire management on adjoining lands.

Managing Access

Public access and visitor facilities have been designed, where possible, to minimise the impact of bushfire on visitors and to limit ignition sources. A strategic public access network for the planning area is described in Section 32 – *Visitor Access*. The Department will maintain a strategic fire access network within the planning area that will comprise both public and strategic access roads and tracks. This network may be maintained to ensure safe access for fire fighting vehicles and to permit effective fire management. An annual road/track maintenance program will be developed, based on available funding and will be planned to consider potential impacts on natural, cultural and recreation values.

Where appropriate, fires may be contained within management units defined by existing roads, rather than by constructing new firelines around the perimeter of the fire. Where temporary roads, firebreaks or firelines are constructed during fire suppression activities, these should be rehabilitated after the fire event (see Section 48 – *Rehabilitation*) to minimise the threat of soil erosion, the introduction of weeds or the spread of disease and the unauthorised use of the access.

Prescribed Burning and Bushfire Suppression

To date, only limited prescribed burning has been carried out in the planning area. Given there is little understanding about fire ecology in the planning area, conducting experimental burns will contribute better information about the impact of fire on flora, fauna and vegetation communities within the planning area and will allow managers to better develop fire regimes and prescribed burning techniques appropriate to the Shark Bay area.

Given the potential for fires to burn over large areas under certain weather conditions, a system of buffers will need to be established in strategic areas across the Shark Bay area prior to the implementation of a prescribed burning program. This will reduce the risk of either prescribed or bushfires burning large parts of the planning area in a single fire event.

---

change over time and hence the analysis only provides an assessment of risk at the time of analysis. Consequently, the analysis process is used as a guide and Department expertise and experience is necessary to formulate long-term risk mitigation strategies.

[10] Slash breaks are areas of reduced fuel where vegetative cover is temporarily reduced to ground cover and root stock. Slashed breaks will generally be in the range of 10 to 30m in width.

Across the State, the Department plans and conducts a program of prescribed burning to achieve objectives that focus on protecting biodiversity, reducing the threat of bushfire to life and community assets; and increasing knowledge of fire ecology and management through fire research, operational experience and monitoring. Ideally, prescribed burning will integrate biodiversity conservation and community asset protection objectives as well as consider the different scales and intervals for fire management in order to optimise outcomes. The Department also develops a 'rolling three-year' indicative burn program together and an 'annual' burn program, which incorporates biodiversity and protection objectives, reviewed on an annual basis. In the development of a burning program suitable for a particular area, factors considered will include:

- fuel and habitat condition (time since last burn) of surrounding areas – it is important that adjacent areas a) provide sufficient habitat diversity to allow animals to disperse from and later recolonise recently burnt areas, and b) ensure the risk of escapes from planned burns are minimised;
- access – surrounding accessible roads or tracks assist in the management of a planned burn, and these would need to be maintained prior to a burn;
- values to be protected – some threatened species and communities, as previously stated may require fire management (including fire exclusion) at a local or patch level;
- key values at risk;
- operational factors influencing the carrying out of a burn; and
- community interest.

An approved Prescribed Fire Plan is to be developed for each burn to be undertaken. It specifies burn objective(s), implementation and post-burn inspection requirements (relative to achievement of the burn objectives) and any monitoring requirements. The Prescribed Fire Plan involves substantial documentation including endorsements and approvals, pre-burn and day-of-burn checklists, supporting documentation, prescriptive documents and post burn assessments. In the development of experimental prescribed burning within the planning area, a similar approach will be taken.

Active bushfire suppression is generally not feasible in most of the planning area due to inaccessibility. However, during the life of the plan, community assets requiring protection from fire will be identified, and suppression activities undertaken as required. Prescribed burning activities in the planning area during the term of this plan will aim to undertake experimental research burns to collect information on fire behaviour, fire ecology, biological indicators and habitat requirements of threatened species and animals, plants and vegetation communities of conservation significance. In addition experimentation with different fire regimes to understand their impacts on flora and fauna of the planning area may be undertaken.

Given the very high value of the threatened fauna populations on Bernier and Dorre islands and the high sensitivity of these islands to fire, a fire response plan should be developed considering factors such as:

- strategies to reduce the risk of fires starting on the islands and reducing the extent of fire runs;
- appropriate methods for bushfire suppression;
- strategies to support, capture or protect threatened fauna in the event of a bushfire; and
- methods for rehabilitation and recovery following a bushfire.

26 – Fire

Key Points:

- Lightning and human-caused fires have shaped many Australian ecosystems for millennia. In the planning area, fire can threaten conservation values, human life and property, so pro-active fire management is integral to conservation and land management.
- While the planning area contains areas of flammable vegetation and experiences periods of severe fire weather, historically, there have been relatively few bushfires probably because of the low risk of ignitions and the large proportion of the planning area that is bounded by sea.
- There is limited knowledge of the role of fire, fuel dynamics, the vital attributes and life histories of flora and fauna in the planning area.
- For the life of this plan, fire management will focus on increasing knowledge of vital attributes of flora and fauna, fire history and fire ecology through fire research, active adaptive management and monitoring. Based on improved understanding, fire management will aim to conserve biodiversity and protect life and community assets.
- The Department will strategically use planned fire and other fuel modification techniques to reduce the potential severity of bushfires, thereby reducing the risk to conservation values, fire fighters, neighbours and visitors and community assets.

- Fire will be excluded from parts of the planning area, including offshore islands, unless there is a clearly identified need to do otherwise.
- Buffel grass (and some other weeds) in the planning area responds vigorously to fire. Fire management objectives may be compromised where this species is present and abundant.
- Diversity and variability in fire regimes at the landscape scale can help maintain biodiversity and patchiness of burning is important in providing habitat heterogeneity at local and landscape scales.

The objectives are:

1. **to protect people, community and conservation assets in and near the planning area; and**
2. **to increase knowledge and understanding of vital attributes of flora and fauna, fire history and fire ecology, as a basis for advancing ecologically appropriate fire management.**

This will be achieved by:

1. in consultation with the local Government authority, FESA and neighbouring landholders, conducting fire planning as required;
2. developing, maintaining and implementing an emergency response plan to facilitate the suppression of bushfires that threaten human life or property, or significant natural values (such as threatened fauna populations on Bernier and Dorre Islands);
3. in consultation with the Shire of Shark Bay, FESA and neighbouring landholders, initiating suppression of bushfires where significant natural values, life and community assets are threatened;
4. developing a fire research plan that will encourage and facilitate research into fire ecology, biological indicators and habitat requirements of animals, plants and vegetation communities, threatened species and species of conservation significance as a basis for advancing ecologically appropriate fire management;
5. encouraging and facilitating research into the effect of fire management strategies on the fauna and flora of the planning area, to ensure that adopted fire regimes do not disadvantage some species (see Section 21 – *Native Animals* and Section 20 – *Native Plants and Vegetation Associations*);
6. conducting experimental prescribed burns to gain knowledge of fire ecology of fire response species, threatened species and plant communities of conservation significance;
7. monitoring the impacts of fire on key values of the planning area, fauna habitat, vegetation complexes and ecosystems where resources are available;
8. providing the public with information on the effects of fire on the natural environment, the need to prevent bushfires, burning practices and safety and survival of people and property;
9. maintaining a strategic network of roads/tracks and breaks for fire management purposes and according to Department standards; and
10. continuing to liaise with local government, local bush fire brigades, neighbouring landholders and other appropriate authorities to ensure community protection from fire is maintained at an appropriate level.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
26.1 The impact of bushfire on life and community assets	26.1 No loss of life, significant community assets, or serious injury attributable to the Department's fire management	Annually
26.2 The impact of fire regimes on threatened flora and fauna populations.	26.2 No loss or declines of threatened flora and fauna populations as a result of fire regimes applied, over the life of the plan.	Every five years.
26.3 Advances in fire ecology knowledge.	26.3 Fire ecology research plan prepared and implemented. Targeted adaptive management programs developed and implemented.	Every five years

PART D. MANAGING OUR CULTURAL HERITAGE

27. HERITAGE LEGISLATION AND POLICY FRAMEWORK

In 1979 Australia, through Australia ICOMOS (Australia International Council on Monuments and Sites), the peak body of professionals working in heritage conservation, adopted the Burra Charter (Australia ICOMOS 1999). This provides for 'the conservation of places of cultural significance' and has a series of guidelines for managing cultural heritage.

Under the Commonwealth EPBC Act, a new national heritage system was introduced in 2004 to strengthen protection for the nation's natural, Indigenous and historic heritage, including statutory protection for places listed on the National and Commonwealth Heritage lists. Actions that are likely to have an impact on the cultural heritage values of National or Commonwealth heritage listed places require approval from the relevant Commonwealth Minister responsible for the EPBC Act.

The *Register of the National Estate* contains a list of places with national value. The Register is a record of important natural, cultural and Indigenous heritage places but offers no statutory protection. The Shark Bay area contains 14 registered sites, one nominated place and one indicative place listed on the Register of the National Estate. One place, the northern end of Dirk Hartog Island encompassing the Cape Inscription area, is listed on the National Heritage List for cultural reasons. The amendments to the EPBC Act in February 2007 will see the phasing out of the RNE as a statutory register within five years, after which it will be retained as an archival record only. No new places will be assessed or added to the RNE in this time.

In Western Australia, the Department of Indigenous Affairs (DIA) is responsible for the administration of the Aboriginal Heritage Act. The Act provides for the protection of sites and objects used by, or traditional to, the original inhabitants of Australia, and the management of Aboriginal sites in consultation with the Aboriginal community. All Aboriginal sites and objects are protected, including those sites not registered with the DIA. Under the Act, it is an offence for anyone to alter in any way an Aboriginal site or object without the relevant Minister's permission. Prior to any development or activity that involves disturbing the land, DIA recommends that suitably qualified consultants be engaged to conduct ethnographic and archaeological surveys of the area to ensure that no site is damaged or altered that would result in a breach of section 17 of the Act. In order to avoid a possible breach of the Act, a Notice under section 18 of the Act should be submitted to the Aboriginal Cultural Material Committee seeking the relevant Minister responsible for the Aboriginal Heritage Act to provide prior written consent to use the land.

The Heritage of WA Act provides for the registration and protection of places of historic interest as 'heritage places'. The Act also requires local Government authorities to maintain an inventory, referred to as the 'Municipal Inventory', of places of heritage significance in their area. Under the provisions of this Act, State Government agencies and local Government authorities are required to cooperate with the Heritage Council in protecting the cultural significance of places both on the State and Commonwealth lists and on the 'Current Assessment Program' list. The Office of Heritage supports the Heritage Council in carrying out its functions. The State Register of Heritage Places database is available at register.heritage.wa.gov.au.

The protection of heritage sites within marine areas are governed by both State and Commonwealth legislation; the Maritime Archaeology Act (State) and the Historic Shipwrecks Act (Commonwealth). Under these Acts, vessels wrecked in State or Commonwealth waters may be protected as historic shipwrecks. Which Act applies, depends on whether the historic shipwreck site is in State or Commonwealth waters. In addition, any relic, structure, camp site or other location of historic interest associated with a historic shipwreck that is found on land and associated with a Commonwealth or State historic shipwreck, is covered by the relevant Commonwealth or State Act. The Western Australian Museum (WAM) is the statutory authority responsible for the administration of the WA Maritime Archaeology Act and the Chief Executive Officer of the WAM is the delegate for the relevant Commonwealth Minister responsible for the Historic Shipwrecks Act. Terrestrial sites include the Saint Alouarn French annexation site, the Cape Inscription Heritage Area, the De Freycinet camp near Cape Lesueur and the shipwreck survivor camps of the *Perseverant* and *Zuytdorp*.

The Department's Policy Statement No. 18 – *Recreation, Tourism and Visitor Services* (DEC 2006b) provides guidelines for managing Indigenous and non-Indigenous cultural heritage. The policy recognises the importance of Indigenous heritage and includes provision for opportunities for Aboriginal involvement in the management of Department-managed lands, such as interpretation of cultural history, anthropological and archaeological survey and site assessment, protection and preservation. It also recognises the need for liaison with appropriate Aboriginal elders concerning management plans, public works and site management and heritage protection measures and consent from relevant elders.

Policy Statement No. 18 also recognises the importance of non-Indigenous heritage and includes provision for recording and protecting sites with identified or potential heritage value and the use of interpretation to raise awareness of the cultural values of sites and their need for protection. Sites are managed according to the principals of the Burra Charter. The Department's 'Recreation and Tourism Information System' database (RATIS) is also used to record sites and places of cultural heritage significance.

While the preservation of any feature of archaeological or historic interest is part of the purpose of national parks, conservation parks and nature reserves, the primary responsibilities for heritage management lie with:

- the Department of Indigenous Affairs (under the Aboriginal Heritage Act);
- the WA Museum (under the WA Maritime Archaeology Act and the Commonwealth Historic Shipwrecks Act); and
- the Heritage Council of WA (under the Heritage of WA Act).

28. INDIGENOUS HERITAGE

The Shark Bay area is part of the Yamatji region inhabited by Malgana and Nanda. Although Gnulli inhabit the area adjacent to the east coastline of Shark Bay north to the Wooramel River, they do not occupy any part of the planning area. Traditional ways of life were and are dependent on an intimate knowledge of the land. People need this knowledge to understand which areas are rich in resources at what times of year. Malgana and Nanda use a deep understanding of the land to make it easier to acquire food, medicines and the requirements for life. Malgana and Nanda live and care for the land with one basic and important understanding – people are intrinsically connected to the environment.

Aboriginal people manage and manipulate various aspects of the land they inhabit to obtain their food resources. Fire in particular is used to create changes in vegetation. In the years preceding European colonisation, the lifestyles of the Aboriginal people and the natural environment would have complemented each other.

The Shark Bay area is significant to Aboriginal people because of their long history of use and occupation and because they have a cultural obligation to understand and care for the area. Aboriginal caring for country is about the protection of significant sites and, just as importantly, the interconnected nature of the sites, people and environment. Much of the information on significant sites may be of a sensitive nature and there is an understanding that the non-disclosure of information be respected. Through the protection of significant sites Malgana and Nanda maintain their heritage identity and culture, and attachment to land.

There continues to be interest by Malgana and Nanda to be involved in the management of conservation estate and maintain cultural ties to the land. It is obvious that by working together with Aboriginal people to care for the land, there will be mutual benefits for the conservation of heritage and environment as well as for cross-cultural awareness. The Department, Malgana and Nanda will continue to work together to establish cooperative management arrangements for the planning area that provides Malgana and Nanda representation and participation in management of the planning area.

The traditional name for Shark Bay in Malgana is *Gadhargudu* (twin waters). There are registered native title claims across the planning area (see Section 6 – *Management Arrangements with Aboriginal People*).

Aboriginal Use and Occupation

The Shark Bay planning area is mainly associated with the Malgana and Nanda people. Tindale (1974) identifies the immediate Shark Bay area as being occupied by the Malgana people with the Nanda people occupying the land south of Freycinet Harbour to Kalbarri.

Archaeological research has been conducted at several sites across the Shark Bay area including Useless Loop, Monkey Mia and Eagle Bluff (Bowdler 1989, 1990a, 1990b, 1995) and Zuytdorp Cliffs near the *Zuytdorp* shipwreck (Morse 1988).

The archaeological research has provided valuable information on occupation and use of the Shark Bay area by Aboriginal people. Bowdler (1990b, 1995, 1999) suggests two periods of Aboriginal occupation of the Shark Bay area; between 4200 and 7000 years before present (BP) and between 30 000 and 18 000 years BP. The hiatus in occupation in both the Pleistocene and Holocene periods is possibly a result of lower sea levels during drier periods, a subsequent lack of fresh water, sea water rises inundating sites, and possible declines in mangrove populations on which Aboriginal people were dependent and change in the food consumed. Occupation of the area may have been continuous and as further research is undertaken, other reasons may be suggested for the hiatus in occupation.

Currently there are about 130 Aboriginal heritage sites registered with the DIA in the Shark Bay area (DIA 2005). Recorded Aboriginal sites include open shell middens, quarries, rock shelters, artefact shelters, burials and stone arrangements with many of the middens associated with the shoreline. The distribution of registered sites represents where the research has occurred in the Shark Bay area and local Aboriginal people are aware of other sites that are not registered. Since the register is not a comprehensive listing of all sites, surveys and assessments will be necessary prior to any operations where there is potential to inadvertently damage sites. Appropriate approvals under the Aboriginal Heritage Act are required before any works that may affect Indigenous cultural heritage values can proceed. Works may include buildings or fixed structures, roads, railways, bridges, water bores or wells or any major earthwork.

Little is known of Aboriginal traditional life and customs prior to the arrival of Europeans. A limited amount of information on the traditional life and customs of these people is available from records of observations made by early European explorers. Drawings made during the French scientific expeditions of 1801 depict semi-permanent Aboriginal camps on Peron Peninsula. Smoke was reportedly seen by navigators on Dirk Hartog Island (St Alouarn), the mainland to the east of Shark Bay (Baudin) and Peron Peninsula (Hamelin and Baudin) (Marchant 1982, Peron (trans) 1809). There is little documented on the extent traditional life continued after European settlement. However, Aboriginal people were involved in industries such as pearling, pastoralism and fishing and some of the sites associated with these industries may have site components or evidence of this involvement.

Since the 1850s, Aboriginal people have been closely involved in the pearling, pastoral and fishing industries. Today Aboriginal people have a strong involvement in the fishing industry.

Bernier, Dorre and Koks Islands

It is generally assumed that the islands were not occupied by Aboriginal people prior to European colonisation (Bowdler 1990a).

From 1908 to 1918, Bernier and Dorre Islands were used for the isolation and treatment of Indigenous people from Western Australia believed to be suffering from venereal disease. The Lock Hospitals were established with female patients residing in an existing house on Dorre Island, and accommodation for males being built near White Beach on Bernier Island. It seems that the patients and their families often had little idea of where or why they were taken. Patients were kept on the islands until they were cured or died. Those who were fit enough hunted game, fished and worked to establish and maintain the hospitals. Remnants of the hospital buildings and artefacts from this era still remain on the islands.

During an anthropological expedition in 1910/11, Daisy Bates described the hospitals as "tombs of the living dead". Admissions decreased after 1913 due to increased costs and in 1918, the hospitals were closed and the patients and buildings relocated to Port Hedland. Hospital records were poorly kept so exact figures cannot be ascertained, but more than 700 patients were admitted of whom close to 200 died on the islands. Aboriginal communities, particularly the people of Carnarvon, are keen to identify and restore gravesites on the islands and ensure that the gravesites are managed appropriately. To date Aboriginal groups and the WA Museum have not located gravesites but have established memorials on the islands for those that suffered and died there.

In 1986, Bernier and Dorre Islands were registered as protected areas under the Aboriginal Heritage Act. The islands also were listed on the Register of the National Estate by the Australian Heritage Commission in 1985. The initial National Estate listing was based on the islands' natural values, but in 1987 the area's cultural heritage significance was added to the listing.

Shark Bay Islands

No evidence has been found of Aboriginal occupation on the island Nature Reserves, though it is likely that Aboriginal people would have visited some of the islands. Salutation Island is accessible by foot at extreme low tides. During periods of lower sea level more than 6000 to 7000 years ago, all of the island Nature Reserves would also have been accessible. In records from the voyage of the *Herald* in 1858, Denham also met with four Aborigines at an island in the southern part of Henri Freycinet Harbour and who were taken on board the ship. He named the island Salutation Island in honour of this event.

Peron Peninsula

Records of early maritime explorers suggest that Peron Peninsula supported a relatively high proportion of Shark Bay's Aboriginal population prior to colonisation. Groups of up to 30 people were reported and drawings depict semi-permanent Aboriginal camps.

Evidence of Aboriginal occupation can be found across Peron Peninsula including middens, artefact scatters, camping places and structures, water wells, fish traps and grinding grooves. Middens have been found at Cape Peron, Cape Rose, Monkey Mia, Goulet Bluff, Eagle Bluff and several sites along the coastline south of Denham. Archaeological collections have been made from sites at Monkey Mia, Eagle Bluff and Silver Dollar (south of Denham) (Bowdler 1990a, 1990b, 1995).

The Silver Dollar site near Eagle Bluff provides the oldest and most detailed evidence of human occupation of the region (Bowdler 1999). The site was occupied for two periods, firstly between 30 000 and 18 000 years and secondly between 7000 and 6000 years (Bowdler 1999). Rockshelter sites at Eagle Bluff and Zuytdorp are dated at 4000 to 4600 years before present (Bowdler 1999, Morse 1988). A third occupation period from 1000 years before present has also been noted at the Monkey Mia sites (Bowdler 1995, 1999).

A number of European explorers noted the presence of Aboriginal people in the area. The crew of the *Naturaliste* saw signs of smoke, while anchored offshore from Cape Peron in 1801. Crew went ashore and were attacked, hence the place name Attack Bay. Hamelin landed and spent time ashore examining an Aboriginal camp although no contact was made. Peron saw Aboriginal people in the vicinity of Cape Peron in 1803. In 1818 De Freycinet also made contact with local Aborigines in this area and sketches were made of them and their camp. In 1839 Grey noted a number of wells on the western side of Peron Peninsula south of Cape Lesueur, thought to have been constructed by Aboriginal people. In 1858 Denham also noted the evidence of Aboriginal camps or sites in the area including an Aboriginal hut in very good condition south of Eagle Bluff.

There are no known historic sites or events associated with Shell Beach Conservation Park and as of 2005, there are no registered Aboriginal sites in the Park. Faure Island was used as a holding area for Aboriginal and other people who were used in the pearling industry.

Nanga Peninsula

There is one midden site near Nanga Resort listed on the DIA database.

Zuytdorp Area

An archaeological survey of the Zuytdorp coast revealed shell midden sites with dates of 4600 and 4000 years before present, suggesting that Aboriginal occupation of the area was probably occasional only as there are few resources for human occupation (Morse 1988).

Other archaeological work within and adjacent to the Reserve has focused on natural wells which occur in the limestone sinkholes and on several sites on Tamala Station (Bowdler 1999, Morse 1988).

Edel Land

There are several midden sites with artefact scatters on Heirisson Prong, Useless Inlet, Pearlers Camp, Bellefin Prong, Wilimia (Willya Mia), Crayfish Bay and False Entrance and there is a quarry at Crayfish Bay. Wilimia was a known place for obtaining fresh water and camping (DIA 2005).

Archaeological collections have been made from sites at Useless Loop and dated to 2300 years before present. Other archaeological sites are at Cosy Corner and Heirisson Prong with the site at Heirisson Prong containing skeletal material (DIA 2005).

In 1801 crew from the *Naturaliste* saw Aborigines whilst exploring Useless Inlet. In 1858 crew from the *Herald* met several Aboriginal people whilst exploring inland south of Disappointment Loop.

Dirk Hartog Island

There is limited knowledge of Aboriginal occupation of the island and little research has been undertaken. There are several known midden sites on the island but the DIA database provides only one record of a midden site in the north-west corner of the island. The period of occupation by Aboriginal people on the island has yet to be determined.

The French explorer St Alouarn in 1772 records seeing smoke on the island as they sailed past Dirk Hartog Island. Crew found what they believed was evidence of fires and a cleared area for dancing. However, no other early European explorer records signs of Aboriginal people or evidence of their occupation of the island.

28 – Indigenous Heritage

Key Points:

- The Department manages Indigenous cultural heritage on terrestrial estate according to the Aboriginal Heritage Act and EPBC Act for Bernier and Dorre Islands.
- There are sites in the planning area listed on the Register of National Estate for their Indigenous cultural significance.
- There is evidence of Indigenous people having occupied the planning area up to 30 000 years before present.
- There are many registered Indigenous sites across the planning area although there are extensive areas where there is little knowledge or evidence. There is also local knowledge of listed sites, places, food and water sources that are not necessarily registered.
- The hunting, gathering and camping lifestyle of Indigenous people is an important part of their culture and there are places that illustrate this aspect of their occupation.
- The planning area is an important place for Indigenous people and they have a strong desire to be involved in future management.
- The significance of the Indigenous heritage of Shark Bay provides opportunities for research and greater understanding of Indigenous heritage.
- The Indigenous heritage of Shark Bay presents unique opportunities for interpretation and education.
- There are two registered native title claims over the planning area.

The objective is to identify, protect, conserve and, where appropriate, present the Indigenous cultural heritage and cultural resources of the planning area in consultation with Indigenous people.

This will be achieved by:

1. protecting and maintaining Indigenous cultural heritage by complying with the relevant State and Commonwealth legislation and Department policy;
2. managing and regularly monitoring threatening processes (such as fire, introduced plants and animals) and visitor activities to ensure Indigenous cultural heritage is not adversely impacted;
3. liaising with and involving local Aboriginal people and relevant organisations, government agencies, organisations and community groups, to improve the protection, conservation and, where necessary restoration, of Indigenous cultural heritage including establishment of cultural heritage management reference groups;
4. presenting information about Indigenous cultural heritage to visitors through appropriate and relevant information, interpretation and education (see Section 55 – *Information, Interpretation and Education*);
5. progressively collecting, collating and documenting information on Indigenous occupation, use and cultural heritage and maintaining a register of this information on the Department's RATIS database and, as required, advising the Department of Indigenous Affairs and Heritage Commission;
6. promoting, encouraging and facilitating research into Indigenous occupation, use and cultural heritage; and

7. consulting with Malgana and Nanda on management plans and proposed public works to identify cultural heritage and cultural resources.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.1 The protection of Indigenous cultural heritage.	28.1 No disturbance of a registered or unregistered place without consultation or formal clearances according to section 18 of the Aboriginal Heritage Act.	Every five years

29. NON-INDIGENOUS HERITAGE

Most of Shark Bay's geographic features were named by or in honour of European explorers. The first recorded European ship to arrive on the west coast was the *Eendracht* in October 1616 commanded by skipper Dirk Hartog. In 1696 Willem de Vlamingh captaining the *Geelvinck* surveyed the area and named several features. In August 1699 William Dampier's expedition in the HMS *Roebuck* was the next recorded European explorer to Shark Bay and, noting the abundance of shark in the bay, named the area "Shark's Bay" (Spencer 1981). Louis St Alouarn in the *Gros Ventre* in 1772 landed at Turtle Bay and took possession of the country in the name of the French King (Marchant 1982).

In 1801 the French scientific expedition in the *Geographe* and *Naturaliste* visited the Shark Bay area and were led by Post Captain Nicholas Baudin in the *Geographe*. Crew from the *Geographe* spent time ashore on Bernier Island and later that year Captain Emmanuel Hamelin in the *Naturaliste* stationed his ship for over a month at Dampier Road off Peron Peninsula whilst exploring the bays (Cornell 1974). Baudin re-visited in 1803. Louis de Freycinet in 1818 as commander of the *Uranie*, spent several days ashore at Peron Peninsula. Lieutenant Phillip King on the HMS *Bathurst* landed at Cape Inscription in 1822 and collected specimens from various parts of the area (King 1827). In 1839 George Grey put ashore on Bernier Island to establish a stores depot and explored the northern coastline and other parts of the Shark Bay area in three whaleboats. In 1858 Captain Henry Mangles Denham in HMS *Herald* spent several weeks in the area undertaking a comprehensive survey of Shark Bay.

Shark Bay is well known as the site of the first recorded European landfall in Western Australia, but the historical significance of other early expeditions from Europe is not so well recognised. Studies and collections made by explorers of the 17th, 18th and 19th centuries represent some of the earliest records of Australia's flora and fauna. Many of these specimens are kept in European museums and are of great value to scientific research. Early explorers noted the abundance of turtle and fish resources in the bay and Dampier, De Freycinet and King all commented favourably on the prodigious quantities of fish and the safe and protected harbour. Early explorers were unable to find freshwater.

The past commercial utilisation of Shark Bay's natural resources has provided a wealth of historic sites and material, much of which are yet to be accurately located and documented. Whaling occurred in the area from 1792 to 1963 (Stanbury 1986) but no land sites associated with early whaling have been found. Guano mining was the first terrestrial industry in Shark Bay and initiated the area's colonial settlement in 1850. Attempts to stop illicit activities in the industry resulted in the Government establishing a military outpost at Quoin Bluff on Dirk Hartog Island then later on Edel Land at Cape Heirisson (D. Cooper 1997). The remains of the military camp at Quoin Bluff can still be found (D. Cooper 1997).

Pearling also developed in the 1850s and numerous small pearling camps were established on the coastline, including Peron Peninsula, Useless Harbour and the eastern shores of Dirk Hartog Island. In 1870 Shark Bay was officially established as a pearling centre although pearl had been taken from the area as early as 1850 (R Cooper 1997). The shallow banks in Shark Bay made the gathering of pearl shell relatively simple when compared to other deep water areas in the State (Lefroy 1978, R. Cooper 1997). By 1873 about eighty pearling boats were licensed and there were 70 Europeans, 118 Malays and 90 Aborigines engaged in the pearling industry (R. Cooper 1997). However the fields that were easiest to harvest soon became depleted. The industry became more regulated when the Government leased set areas to licensed operators. The decline in the pearling industry in the 1930s coincided with World War II, the introduction of plastics and the reduction in demand for mother-of-pearl shell and the subsequent reduced sale of pearls to Japan. The fishing industry began in the early 1900s and was the community's economic mainstay for most of the 20th century.

The first pastoral leases were granted in the 1860s and sandalwood originally exported from the region in 1890. Initially the first pastoral leases were small but over time some combined and by the 1920s many of the pastoral stations as we know them today were established. The early settlers usually carried out a combination of occupations including pearling, fishing, pastoralism and sandalwood cutting.

Heritage Sites

Shipwrecks, relics and campsites associated with Shark Bay's pre-1900 maritime history are managed by the WA Museum (WA Museum 2005). An arrangement between the Department and the WA Museum defines management responsibilities and consultative processes for accessing sites such as the *Zuytdorp* wreck but may require revising given the historical importance of additional areas to be set aside for conservation.

Maritime heritage management is relevant across the planning area because of the early European exploration landings and artefacts, sites of shipwrecks, whaling activities, guano mining on the islands and pearling camps on shorelines. Of particular note are:

- Zuytdorp Nature Reserve, adjacent to the landing site for survivors of the *Zuytdorp* shipwreck;
- Dirk Hartog Island, landings and artefacts from European exploration, especially on the northern part of the island;
- island Nature Reserves, some of which have relicts from guano mining operations; and
- peninsulas which supported several pearling camps and may yield artefacts from early European exploration, settlement and use.

The land camps associated with pearling and guano mining are particularly sensitive to disturbance from increasing visitation. A general requirement for the protection of heritage sites is that visitors should not be allowed to use or have in their possession metal detectors without a permit. Fossicking by enthusiasts and souvenir hunters for historical relics disturbs archaeological sites and contexts and removes valuable archaeological information from sites.

In 2006 the Cape Inscription area was registered on the National Heritage List for its cultural heritage values and therefore is protected under the EPBC Act. Cape Inscription is significant as the site where the early explorers Hartog and later de Vlamingh landed and left inscribed plates as recorded evidence of their visit. Several places across Shark Bay are listed on the Register of the National Estate although only Cape Inscription Light station is registered for its historic value. Several other heritage places have been identified by the Heritage Council across the Shark Bay area as having heritage importance but have yet to be placed on the assessment program. Sites in the terrestrial reserves which may be considered for some form of heritage listing in the future include: remnants from the pastoral era; camp sites of early European explorers; military camps at Quoin Bluff South established to manage guano activities and other guano shore-based camp sites; pearling camps; and grave sites of early explorers and settlers.

Bernier, Dorre and Koks Islands

Exploration

In 1696 de Vlamingh captaining the *Geelvinck* surveyed and named "Dor Eyland" or Dorre Island (Robert 1972), dor being the Dutch word for dry or barren. Bernier Island was not named until the French scientific explorations of 1801, being named after the expedition's astronomer, Pierre François Bernier. During Dampier's expedition in the HMS *Roebuck* in 1699, botanical samples were collected from Bernier Island and a brief account of the island's natural history was written (Spencer 1981).

After Dampier, no visit was recorded until the 1801 French scientific expedition led by Baudin in the *Geographe*. Baudin spent several days on Bernier Island collecting many flora and fauna specimens (Cornell 1974). Peron went ashore on Bernier Island on 29 June 1801 and provided interesting observations in his diary of the sandy soils and native plants and animals, both terrestrial and marine (Peron 1809). In 1818 crew from de Freycinet's *Uranie* explored Bernier and Dorre Islands with Arago drawing several features of the area (Marchant 1982).

King on the HMS *Bathurst* collected specimens from the islands in 1822 (King 1827). Grey in 1839 explored the northern coastline with three whaleboats and was put ashore on Bernier Island from the ship *Russell* on 25 February, stayed for 3 days, searched unsuccessfully for water and deposited some stores in anticipation of a return trip (Grey 1841). Grey again landed on Bernier Island on 20 March 1839 (Grey 1841). Unfortunately the depot of goods stored on the island had been badly damaged in what he recorded as a hurricane, leaving his crew in dire straits for the journey to the Swan River.

At least four shipwrecks have been recorded as having occurred around the islands between 1839 and 1916.

Post Settlement

During his search for pearl shell beds in 1860, the pioneer Julius Brockman camped on the southern end of Dorre Island and his campfire caused a bushfire to burn much of the island. This was the first of three major fires on the Island caused by human use.

The islands were leased for pastoral use as early as 1864, but grazing only occurred for about 10 years on Bernier Island and reportedly not at all on Dorre (Ride 1962). Sandalwood cutters operated on Bernier Island in 1896 (Ride 1962).

Shark Bay Islands

Exploration

Many of the islands in Shark Bay were named after crew of the ships from French scientific expeditions of the early 1800s including Faure, Baudin, Freycinet and Lefebre. Denham, captain of the *Herald*, also named several islands during his comprehensive survey of Shark Bay in 1858 including Pelican, Salutation, Smith, Wilds and Egg Islands.

Post Settlement

The accumulation of guano on the islands of Shark Bay stimulated the first European land use and settlement of the area. Guano provided the Swan River Colony with one of its earliest commercial exports and in 1850 the government stationed a military force on Dirk Hartog Island at Quoin Bluff, then later at Cape Heirisson to prevent the illicit removal of guano by foreign interests (D Cooper 1997).

Groups of convicts were sent to dig guano on at least 13 islands between 1850 and 1880, but there is generally little information about guano mining operations. Guano was taken off Smith Island and Eagle Island for use on plantations at Carnarvon (Fry 1995b).

Salutation Island was once used by pastoralists as a ram paddock during winter months. Slope Island is now used as a storage area and loading ramp for the salt being produced at Useless Loop. Other use of the islands since 1900 has been for conservation, recreation and research purposes.

Peron Peninsula

Exploration

Most of Francois Peron National Park's geographic features were named by or in honour of European explorers.

Hamelin in the *Naturaliste* in 1801 stationed his ship for over a month at Dampier Road, on the north-west side of Peron Peninsula (Cornell 1974). From here his crew explored and mapped much of the area, naming many of the features of the bay. In 1803 several members from the *Geographe* made excursions to different parts of the Peninsula (Cornell 1974). Peron walked across Peron Peninsula from east to west in March 1803, making notes on flora, fauna and Aboriginal people (Peron 1809, Cornell 1974).

De Freycinet in the *Uranie* in 1818 established a land base in the vicinity of Cape Lesueur (Marchant 1982, Riviere 1996). They spent several days camped ashore whilst exploring the area and being unable to find fresh water, they successfully distilled sea water.

Denham, captain of the survey vessel HMS *Herald*, spent several weeks in the area from March 1858 whilst comprehensively surveying the Shark Bay area (David 1995). On a stone high up on Eagle Bluff, were the words "HERALD DENHAM 1858" but unfortunately this stone broke away from the bluff and has since been moved to Denham township. Denham landed at Little Lagoon and Cape Lesueur. A survey party from the *Herald* landed at Herald Bight to collect specimens and met with several Aboriginal people (David 1995). Several other landings by crew from the *Herald* occurred around the shores of Hamelin Pool whilst conducting a survey of this part of the bay.

At least three shipwrecks have been recorded as having occurred around Peron Peninsula between 1839 and 1925.

Post Settlement

Pearling camps were established at Cape Lesueur, Middle Camp, Freshwater Camp (Denham), Monkey Mia, Cape Rose and Herald Bight (Lefroy 1978, R Cooper 1997) but eventually the lack of freshwater forced the pearlers to move to Freshwater Camp (now Denham). With the decline of the pearling industry by the 1930s, Shark Bay's fishing industry was established and a cannery and processing works was built at Herald Bight (R Cooper 1997).

A large area in the southern part of the peninsula was first leased in 1879 for sheep grazing whilst a smaller area north of Cape Lesueur was first leased in 1881 (R Cooper 1997). By 1886 pastoral leases covering almost the whole of the peninsula were held by one individual and the area became known as Peron Station (R Cooper 1997). For several years crops were grown on the station and it is also likely that sandalwood was pulled to supplement the pastoral income (R Cooper 1997).

Peron Station continued to operate until 1990 when it was purchased by the WA Government. Francois Peron National Park was created whilst the area known as South Peron became unallocated Crown land. Several sites associated with Peron Station are interpreted for their heritage value including the homestead.

The original Peron Homestead was located in Denham. From the 1940/50s, the focus of pastoral activity on Peron Station was at the Park's Peron Homestead, which was constructed in the 1950s. The homestead is now the main orientation site for visitors to the Park, following its renovation in 1997-98. The structures retained in the precinct include the renovated Peron Homestead, windmills, renovated overseer's quarters (as an interpretive centre), a shearers' quarters, a cook house, shearing shed and yards, a killing shed, machinery shed, tack room and horse yards. Any new structures built in the Peron Homestead precinct will be designed to maintain the precinct's distinctive pastoral character.

The *Heritage Assessment of the Peron Homestead and Station Precinct* (Suba 1995) provides guidelines for managing the area's cultural heritage values. Individually the remaining structures have local heritage significance. Collectively the precinct's structures and spaces provide an authentic, aesthetic character which should be maintained and used to interpret the area's heritage, particularly the resourcefulness and ingenuity of pastoral life. Renovations and improvements continue to be made and a station life walk trail has been developed.

Elsewhere in the Park and the proposed reserve additions, the remains of pastoral infrastructure including fences, water pipes, tanks, troughs and mills can be found. Infrastructure which is unsightly, serves no management purpose or is unsafe will be removed or reused. Some infrastructure should be retained as a reminder of the area's pastoral history.

There are no known historic sites or events associated with Shell Beach Conservation Park. The Park was previously part of Peron Station which was purchased by the WA Government in 1990.

Nanga Peninsula

Exploration

The coastline around Nanga Peninsula was explored by crew of *Urani*e in 1818 then again by crew of HMS *Herald* in 1858. Many of the features were named during these explorations. A shipwreck which occurred in 1904 lies off shore from Faure Island.

Post Settlement

Pastoral leases were held over the Nanga Peninsula by pastoralists who held leases over parts of Peron Peninsula or areas around Wooramel. Initially a separate lease was held over the Petit Point area. By1909, these smaller leases were amalgamated into Nanga Station (R Cooper 1997). After World War II, a lease was established on the southern part of the peninsula and a homestead built at Nilemah (Edwards 1999). This area was later added to the Nanga lease (Edwards 1999) and the ruins of the old Nilemah Homestead still remain.

In the 1930s Nanga Station is believed to have run up to 14 000 sheep (R Cooper 1997). Although bores were established on the northern part of the lease, the southern portion was never fully developed. With the establishment of a tourist development at Nanga in the 1960s, the emphasis on sheep production by the pastoral lease holders was reduced. Nanga station was jointly purchased by the Commonwealth and WA Governments in December 2000 for conservation purposes.

Zuytdorp Area

Exploration

The Zuytdorp Nature Reserve takes its name from the ship *Zuytdorp* which was wrecked in 1712 en route to Batavia. There are no known registered heritage sites of European origin on Zuytdorp Nature Reserve. However the *Zuytdorp* wreck lies against the cliffs, immediately adjacent to the Reserve. Expeditions to the wreck site showed evidence of people having survived the wreck (Morse 1990). The fate of the survivors remains a mystery but there have been suggestions that they came ashore in the area and were assisted by Aborigines (Stanbury 1986).

Waters in a 500 m radius around the wreck are gazetted under the Commonwealth Historic Shipwrecks Act as a protected zone. The State Maritime Archaeology Act also applies to the wreck, its relics and associated campsites, and the WA Museum has a 7.3 ha reserve known as the Zuytdorp Cliffs Reserve on the coast for the purpose of 'Protection of the Zuytdorp Wreck'. The *Zuytdorp Cliffs Reserve Bylaws 1971* prohibit lighting fires, digging or the removal of any objects from the Reserve, and the carrying of diving equipment and firearms in the Reserve. The WA Museum is aware of reports of European material related to the *Zuytdorp* survivors existing outside the Zuytdorp Cliffs Reserve and therefore management of the Zuytdorp Nature Reserve should consider the possibility of archaeological material in any management decisions relating to the wider area.

Visitors, including commercial fishermen, to the site of the wreck travel along the State Barrier Fence and through Zuytdorp Nature Reserve, so it is essential that the Department, the WA Museum, the Department of Fisheries, the Department of Agriculture and Food and adjacent pastoral lease holders work closely to manage visitor use and protect heritage and landscape values of the area.

Post Settlement

Pastoral activities were once the primary land use in the area with a number of small leases established in the late 1800s. Stock routes were developed along the coastline and eastern boundary of the Zuytdorp Nature Reserve and stock and wool would be transported between Murchison House, Tamala and other Shark Bay stations to be loaded on lighters at Flagpole Landing or Tamala or sent south to Murchison River (R Cooper 1997, Edwards 1999).

The WA and Commonwealth Governments purchased the northern part of Murchison House Station and north of the State Barrier Fence adjoining Zuytdorp Nature Reserve in August 2005 and the southern part of Tamala Station in April 2006.

The area proposed for addition to the Reserve contains the soaks and the ruins of water tanks built in the days when the area was used as a stock route. These tanks have some heritage value and may be considered for listing on the Municipal Inventory of historic sites or the State Register of Historic Places. The WA Heritage Council is keen for some of the tanks to be stabilised or restored. Other sites of heritage significance in this area include the stock fence at Woomerangee Hill and wells built by station workers.

Edel Land

Exploration

Edel Land takes its name from a member of the De Houtman expedition of 1619, uppermerchant Jacob d'Edel (Robert 1972)[11].

The tall cliffs and strong sea swells along the western coastline of Edel Land prevented any landing by early European explorers and the rugged coastline represented a hazard to early sailors.

In February 1697 members of the de Vlamingh expedition explored parts of Shark Bay (Robert 1972). Anchored off Dirk Hartog Island in Turtle Bay, de Vlamingh dispatched boats to explore what became known as Denham Sound. Although it is difficult to accurately determine the course of their survey, the ship's journal indicates they camped ashore on either Heirisson Prong or Bellefin Prong (Robert 1972).

[11] Edel Land, as named by Frederic de Houtman in 1619 after Jacob d'Edel the super-cargo on one of the expedition ships, refers to the mainland between Champion Bay (Geraldton) and Shark Bay. For the purpose of this management plan, Edel Land refers to the northern part of the peninsula only.

Hamelin, captain of the *Naturaliste* in 1801 instructed Louis de Freycinet to explore the southern parts of Denham Sound (Marchant 1982). During this part of the expedition many features and places were named after members of the expedition. Bellefin was the surgeon and Heirisson the sub lieutenant on the *Naturaliste*. The harbour at the southern part of the bay was named by Louis de Freycinet after his brother Henri.

In March 1858 Captain Henry Mangles Denham, sailing in the HMS *Herald* during his comprehensive survey of Shark Bay, landed on Cape Bellefin and Cape Heirisson (David 1995). Later on, a survey party landed at Disappointment Loop at the southern end of Freycinet Estuary (David 1995).

Post Settlement

In February 1851 the military base at Quoin Bluff on Dirk Hartog Island was relocated to Cape Heirisson to be closer to the islands being mined for guano (D Cooper 1997). With guano supplies diminishing, the Shark Bay outpost was occupied for only 12 months (D Cooper 1997). No evidence of the remains of the outpost at Cape Heirisson can be found today and it is likely the materials were recycled by the pearlers (D Cooper 1997).

Initially most of the pearling activity was concentrated around Useless Inlet. Pearling camps in this area included Cosy Corner, Yankee Town, Chinatown, South Camp, Tundenerra and Thomson's on the eastern shore whilst on the western shore were Upper Wells, Well Bank, Lower Wells, Fletcher's and Brockman's camps (R Cooper 1997). Willyah Mia, located on the eastern shore of Useless Inlet on Heirisson Prong, was probably the first and one of the largest pearling camps in Shark Bay with a trading store and shanty pub built at Willyah Mia at the peak of the pearling in 1873 (R Cooper 1997). Pearlers, (Malays, Chinese, Aborigines and Europeans), lived in rough camps along the shoreline and fresh water was found in beach wells on the western shore of the inlet. Many pearlers are recorded as having died from drowning or disease and are buried in the sand hills behind the beach (Edwards 1999). A grave with a headstone in this area is believed to belong to a pearler, Charles Hansen, who was taken by a shark (R Cooper 1997, Edwards 1999). By 1874 the easily accessible pearl shell was depleted and, along with disease, led to an exodus of pearlers (R Cooper 1997).

The first pastoral lease was taken up at Browns Inlet in 1881 and leases over much of the Carrarang area were held by various people until they were amalgamated into one lease about 1885 (R Cooper 1997). At one stage up to 15 000 sheep were run on the station (R Cooper 1997). Bellefin Prong was not developed for pastoral use and shows little sign of grazing.

The salt works at Useless Loop commenced operations in 1961 (Fry 1995). An extensive area of bay has been progressively blocked off at Useless Loop for the formation of large evaporation ponds. A deep water jetty for the loading of the salt has been constructed. The ships used to transport the salt access the area along a dredged channel that requires occasional maintenance.

The *Nor 6* hit the cliffs at False Entrance on 24 April 1963 and was wrecked (Fry 1995). The skipper, Jack Drinan, survived by getting into an icebox and eventually made it ashore in South Passage but the bodies of the other three crew members were never found.

Dirk Hartog Island

Exploration

Captain Dirk Hartog landed on Dirk Hartog Island on 25 October 1616 leaving a pewter plate inscribed with a message nailed to a post at the site now known as Cape Inscription (Marchant 1982). This post and plate represent the first physical evidence of European arrival in Australia.

On 30 January 1697 de Vlamingh's ships (*Geelvinck* and *Nyptangh*) anchored in South Passage between what is now known as the southern tip of Dirk Hartog Island and Steep Point and boats were dispatched over the next four days to sail around the island (Robert 1972, Playford 1998). On 2 February men in the *Geelvinck's* pinnace went ashore at the north end of the island at Cape Inscription, climbing the cliff and finding an oak post with a pewter plate lying beside it. Vlamingh replaced Hartog's plate with one of his own, inscribing the original message and adding a record of his own visit before nailing it to a new post (Robert 1972, Playford 1998). Expedition members explored parts of Shark Bay for several days and recorded that turtles can be turned over and eggs collected on a beach now known as Turtle Bay (Robert 1972, Playford 1998).

Dampier in the HMS *Roebuck* in 1699 spent several days in Shark Bay anchored off Dirk Hartog Island at what is now known as Dampier's Landing, south-east of Cape Inscription (Spencer 1981). Dampier spent time on the Island looking for fresh water and although unsuccessful, he did manage to obtain a good supply of firewood

(Spencer 1981). Dampier made many valuable observations of the plants and animals of Shark Bay and especially of Dirk Hartog Island, where he made the first collection of Australian plants at what is now known as Dampier Landing. This collection is still preserved at Oxford University.

St Alouarn in the *Gros Ventre* in 1772 landed at Turtle Bay and took possession of the country in the name of the French king (Marchant 1982). Two bottles, one reportedly containing a parchment recording the event, were sealed with silver coins and buried at the foot of a tree (Marchant 1982). During an expedition to the area in 1998 a party led by Phillipe Godard, found a French silver coin in the lead seal of a bottle that had been left there by St Alouarn in 1772. Soon afterwards, the Western Australian Museum found, at the same site, an intact bottle, with an attached lead seal and silver coin (Edwards 1999). Further excavations of the area were undertaken by the WA Museum in 2006. The report of this survey states that no additional evidence was discovered (Green *et al.* 2007). The report recommends that site management plan including interpretation requirements be prepared in consultation with WA Museum.

Vlamingh's plate remained untouched at Cape Inscription for 104 years before being found by a sailor from the French vessel *Naturaliste* in July 1801 (Playford 1998, Cornell 1974). Hamelin of the *Naturaliste* believed it would be sacrilege to remove the plate and nailed it to a new post and fixed a lead plate recording his visit to another post at a prominent headland on the north-east side of the island (Playford 1998, Cornell 1974). The precise locality of this second post is not known and the lead plate has never been found (Playford 1998). One of Hamelin's young officers, Louis de Freycinet, was not happy with the decision to leave the Vlamingh plate on the island. In 1818 as commander of the *Uranie*, he recovered the plate on 13 September and had it delivered to the Royal Academy of Inscriptions and Elegant Literature in Paris (Playford 1998, Marchant 1982). In 1947 this plate was returned to Australia and is now on display at the Western Australian Maritime Museum (Playford 1998).

On 21 January 1822 King, commander of the HMS *Bathurst*, landed at Cape Inscription to discover that the memorial plates had been removed from the two posts (King 1827). To mark his visit he left his name and the name of one of his officers, John Septimus Roe, on the Hamelin post (King 1827, Playford 1998).

The original Hartog plate is located in the Rijksmuseum in Amsterdam, and in 1947 the Vlamingh plate was returned to Australia and is now on display at the WA Maritime Museum in Fremantle. The Vlamingh and Hamelin original posts were removed in 1908 and are now held at the WA Maritime Museum. Representations of these original posts were installed in 1997.

On 28 March 1839 Grey landed on Dirk Hartog Island during his return voyage from the north (Grey 1841). He spent part of a day exploring the Island noting its heath-like vegetation. Grey travelled southwards along the east side of the Island before sailing with some difficulty though the passage between Steep Point and Dirk Hartog Island (Grey 1841).

On 6 March 1858 Denham in the *Herald* anchored offshore from Cape Inscription. He visited Cape Inscription and found a post with 'King 1822' to which he added '*Herald* 1858' (David 1995). Denham made a comprehensive survey of Shark Bay spending several weeks in the area and naming many prominent features.

Several shipwrecks have been found on the Island. The French whaler, *Perseverant*, foundered off Dirk Hartog Island in 1841 and crew from the ship spent several weeks camped on the island with five men dying of scurvy (Henderson 1980 cited in Stanbury 1986). This site and the adjacent survivors' camping area require protection and interpretation. Green *et al.* (2007) recommends that the site be declared a maritime archaeological site under the Maritime Archaeology Act and a site management plan including interpretation requirements is prepared in consultation with WA Museum.

Guano loading was a hazardous task and in 1850 the *Prince Charlie* struck Cape Levillain after loading guano (Henderson 1980 cited in Stanbury 1986) and in 1878 the brigantine *Macquarie* also ran aground on the Levillain shoal (WA Museum cited in Stanbury 1986). The *Beagle* in 1904 is believed to have run aground at Dampier Reef to the north of the island. A cyclone in 1921 resulted in a pearl boat being washed ashore on Dirk Hartog Island at a place called Tumbledown and two Malay sailors were drowned (Fry 1995b).

Post Settlement

A military camp, the Irwin Station, was established at Quoin Bluff South on Dirk Hartog Island in 1850 and the remains of the camp are easily identifiable today (D Cooper 1997). In the bay to the north of the bluff, a stone jetty and the foundations of camp structures still exist and artefacts such as nails, china and buttons have been

noted (D Cooper 1997). Green *et al.* (2007) recommends that the site be protected under either the Maritime Archaeology Act or Heritage of Western Australia Act and that the two building sites be excavated.

On Dirk Hartog Island pearling camps were established at Notch Point Bay, Tetradon Loop, Tumbledown Camp and Cross's Camp (R Cooper 1997). The largest camp at Notch Point Bay had more than fifty pearlers stationed there in 1886 (R Cooper 1997). The remains of structures, artefacts and other evidence from these camps can be found at these sites. Green *et al.* (2007) recommends that the Notch Point pearling camps be declared a maritime archaeological site under the Maritime Archaeology Act and that any developments and interpretation of the area be prepared in consultation between WA Museum, DIA and the Department.

Dirk Hartog Island was first settled for pastoral purposes in 1860 with the first lease issued to von Bibra in 1868 (R Cooper 1997). At about the same time Aubrey Brown had a lease over the southern part of the island and another on the mainland at Browns Inlet (Edwards 1999). Over the years the island pastoral lease has had various lessees and by the early 1960s it was estimated to contain 20 000 sheep and goats (R Cooper 1997). Today sheep and goats are being progressively removed. Several out-camps were constructed including Sammy Well at Dampier Landing near Cape Levillain, Herald Bay and Sandy Bay. The Herald Bay out-camp contains relatively sophisticated building ruins as well as water catchment and handling yards. This structure was initially thought to be the remains of the von Bibra homestead 'Killarney' but recent work by the WA Museum (Green *et al*. 2007), suggests this is not the case. The out-station at Sandy Bay contains substantial infrastructure and facilities. Various other infrastructures such as wells and windmills are located across the Island. In more recent years island operations have increasingly focussed on tourism and less on sheep production. In June 2005 the WA Government reached agreement with the pastoral lease holder to purchase the pastoral lease over the island and establish a national park.

To protect coastal shipping, construction of a lighthouse at Cape Inscription commenced in 1908 along with quarters for two lighthouse keepers, a storehouse, oil store, a 20 000 gallon underground water tank and stable (Palassis Architects 1996, Grey and Forgione 2004). In Turtle Bay, a 232 foot long jetty was built with a two foot gauge tramway to facilitate the delivery of goods to the lighthouse and a horse operated winch to haul freight up the cliffs (R Cooper 1997). In 1917 the lighthouse became automated and consequently unmanned. The Cape Inscription area was placed on the Australian Register of the National Estate on 6 October 1994 and on the National Heritage List in 2006. The Cape Inscription Lighthouse and Quarters was entered on the register of Heritage Places (P03261) in 2001. It is also classified by the National Trust of Australia (WA) and adopted to the Shire of Shark Bay Municipal Heritage Inventory. The future vesting and management of Crown Reserve 14918 encompassing an area of about 300 ha around Cape Inscription is being negotiated between the Shire of Shark Bay, DPI and the Department.

In the 1930s and 1940s whales were captured around Dirk Hartog Island by chaser boats then taken to a processing ship which was anchored at Sandy Point (Fry 1995b).

29 – Non-Indigenous Heritage

Key Points:

- The Department manages non-Indigenous cultural heritage on terrestrial estate according to Department Policy Statement No. 18 – *Recreation, Tourism and Visitor Services* (2006), the Burra Charter, the Heritage of Western Australia Act, the Historic Shipwrecks Act (Commonwealth) and the Maritime Archaeology Act (State) for any objects or sites on land associated with a wreck in Commonwealth and State waters respectively, and the Environmental Protection and Biodiversity Conservation Act.
- Early European exploration of the West Australian coast of the Shark Bay area is of national significance.
- Early European settlement and use associated with guano, pearling, pastoral and whaling activities of the Shark Bay area is of State and local significance.
- Management for the protection of non-Indigenous cultural heritage will require close liaison with and involvement of WA Museum and the local community.
- The condition of heritage sites and artefacts associated with exploration and post settlement varies and may require additional and special protection and management.
- The significance of the heritage of Shark Bay in the exploration and settlement of Australia and Western Australia provide opportunities for research and greater understanding of non-Indigenous heritage.
- The early European exploration and settlement of Shark Bay presents unique opportunities for interpretation and education.

The objective is to identify, protect, conserve and present the non-Indigenous cultural heritage of the planning area.

This will be achieved by:

1. protecting and maintaining non-Indigenous cultural heritage sites and artefacts according to State and Commonwealth legislation, the Burra Charter and Department policy;
2. managing and regularly monitoring threatening process (such as fire, introduced plants and animals) and visitor activities to ensure non-Indigenous cultural heritage is not adversely impacted;
3. liaising with and involving local people, relevant government agencies, organisations and community groups, to improve the identification, protection, conservation and, where necessary restoration, of non-Indigenous cultural heritage including those associated with European exploration and post settlement;
4. developing site management plans for heritage sites in consultation with appropriate organisations such as WA Museum;
5. presenting information about non-Indigenous cultural heritage to visitors through appropriate and relevant information, interpretation and education (see Section 55 – *Information, Interpretation and Education*). Information could be provided to visitors on:
   - European exploration including shipwreck sites;
   - commercial enterprises including guano mining, pearling, whaling and pastoral activities; and
   - heritage conservation programs.
6. progressively collecting, collating and documenting information on non-Indigenous occupation, use and cultural heritage and maintaining a register of this information on the Department's RATIS database and as required, advise the National Trust, relevant Municipal Council and Heritage Commission;
7. promoting, encouraging and facilitating research into non-Indigenous occupation, use and cultural heritage sites of occupation and use;
8. in conjunction with the appropriate organisation such as WA Museum, undertaking an assessment of heritage places as required; and
9. educating visitors about the importance of protecting heritage places and that artefacts are protected and not to be disturbed.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
29.1 The protection of non-Indigenous cultural heritage.	29.1 Development of a non-Indigenous cultural heritage inventory across the planning area.	After five years

PART E. MANAGING VISITOR USE

It is recognised that the public conservation estate managed by the Department has the capacity to provide a significant portion of the public's growing demand for outdoor recreation and tourism, in particular 'nature-based' tourism. In doing so the conservation estate contributes significantly to the social, psychological, physical and economic well-being of the community, with a subsequent benefit being that people develop greater attachment to, regard for and understanding of conservation places by spending time in them.

The number of visitors to the State's reserve system has increased markedly over the past decade, from 8.3 million visits in 1998-99 year to over 14.2 million in 2009-10. The reason for such significant human interest is simple: as of June 2010 the estate managed by the Department covers an area of about 27.4 million ha of lands (including 5.8 million ha of former pastoral lands) and 1.5 million ha of waters, protecting unique landscapes, seascapes, geological formations, plants and animals, and cultural sites.

Conserving these lands and waters for future generations and managing them for use by the present one is a complex process for a number of reasons. Firstly, public expectations for recreation and tourism are as diverse as the environments the Department manages. Secondly, whilst the public conservation estate brings many benefits to the community as well as the environment, the desire to interact with these unique environments can lead to unacceptable impacts on the natural environment. Thirdly, there is a worldwide recognition that healthy outdoor activity is good for people physically and psychologically (Maller *et al.* 2002). For these reasons, the planning area provides numerous recreation opportunities for local communities, as well as regional, national and international tourism. Finally, the Department also considers the social and economic dependence of local communities in the way it manages the estate entrusted to it, and the opportunities that may arise from it. The proposals in this management plan and the Department's subsequent management activities are important to the well-being of the regional economy.

The demand for recreation and tourism opportunities in natural areas is reflected in the principal objectives and policies of the Department for managing recreational use. A number of policies, available from the Department on request, provide guidance for recreation and tourism management, including:

- Policy Statement No. 18 – *Recreation, Tourism and Visitor Services* (DEC 2006b);
- Policy Statement No. 34 – *Visual Resource Management of Lands and Waters managed by CALM* (CALM 1989);
- Policy Statement No. 53 – *Visitor Risk Managemen*t (CALM 1997); and
- Policy Statement No. 62 – *Identification and Management of Wilderness and Surrounding Areas* (CALM 2004).

The many special interest groups such as bushwalkers, fishers, four-wheel drivers, sea kayakers and campers, have a strong interest in maintaining or increasing their use of the planning area. The desire to interact with these natural environments can lead to detrimental impacts, such as soil compaction and erosion (see Section 18 – *Geology, Landforms and Soils*), damage to flora (see Section 20 – *Native Plants and Vegetation Associations*) and fauna (see Section 21 – *Native Animals*), and the introduction and spread of weeds (see Section 23 – *Environmental Weeds*) and the introduction and spread of diseases (see Section 25 – *Diseases*).

Recreation and tourism activity and development should be compatible with the vesting purpose of the land and water or the established land/water use priority. In addition, the provision of visitor services, facilities and experiences in the planning area should be determined in the context of the range of opportunities available in neighbouring parks and reserves across the Department's Midwest Region and opportunities provided by neighbouring land holders including tourism providers. The visitor use strategies in this document also need to be consistent with other key documents produced for the Shark Bay area including the *Shark Bay Regional Strategy* (WA Planning Commission1997), *Shark Bay Marine Reserves Management Plan 1996-2006* (CALM 2000), the *Shark Bay World Heritage Area Interpretation Action Plan* (2003b), the *Shark Bay World Heritage Property Strategic Plan* (DEC 2008a) and the coastal development setback guidelines and developments in cyclone prone areas found in the State Planning Policy 2.6 State Coastal Planning Policy.

This management plan proposed the addition of a range of areas to the conservation estate (see Section 11 – *Existing and Proposed Tenure*), such as South Peron, Edel Land and Dirk Hartog Island. In the past, these areas were managed by pastoral lessees or the Shire of Shark Bay. Addition of these areas to the reserve system will

provide more consistency in the management of visitors and their impacts as well as providing a greater range of visitor opportunities across a wider area.

Recreation and tourism planning considers a range of factors including visitor risk, environmental impacts, social benefit, equity, public demand and potential economic benefit. Prior to the development of recreation sites, the Department uses a detailed process of planning and design to assess the potential visitor impacts on the sites. Proposed developments are assessed using a variety of environmental, social and cultural factors. The environmental factors include geological, topographic, soil condition and type, water (surface and groundwater) quantity and quality, vegetative cover condition and significance, other biota (such as flora and fauna and their significance) and visual quality. The social factors are determined using questions relating to the condition of recreation sites found in the Department's Visitor Satisfaction Survey which are distributed to visitors at major recreation sites within the planning area and adjacent areas such as Hamelin Pool and Monkey Mia. The cultural factors include Indigenous and non-Indigenous heritage sites, artefacts and records.

The management plan provides guidelines for ensuring people visiting the planning area gain an appreciation of the area's natural values which should, in turn, foster an appreciation and understanding of conservation and those users are better informed about access and appropriate activities in the planning area. Further, the plan provides guidelines to minimise environmental impacts by developing and directing people to more robust sites and providing a wider range of opportunities to distribute visitor pressures.

Managing the way people use the planning area applies an adaptive management approach, where management policies and practices are continually improved by learning from the outcomes of operational programs, research and monitoring. The plan utilises best available knowledge to develop practices aimed at meeting specific management objectives. Monitoring, regular review, analysis of management outcomes and ongoing research are critical if land management in the planning area is to continuously improve.

In this chapter of the management plan, general objectives and strategies for managing visitor use across the whole of the planning area are described in Sections 30-37. Sections 38-44 then deal with managing visitor use in specific parts of the planning area, these being;

- Bernier, Dorre and Koks Islands;
- Shark Bay Islands;
- Peron Peninsula;
- Nanga Peninsula;
- Zuytdorp Area;
- Edel Land; and
- Dirk Hartog Island.

30. RECREATION USE PLANNING

Managing the way people use the planning area involves the management of recreation, commercial activities, public safety, visitor education, interpretation and information. The recreation planning framework adopted in this plan uses both visitor management settings and a classification of recreation sites according to an established site hierarchy. It also draws upon information presented in other planning documents developed for the Shark Bay area.

Visitor Management Settings

As the use of natural areas increases, resource conditions can change until the character of the place has been modified to a point where it no longer has the attributes that originally attracted people to the area. As a consequence, the initial users are displaced by people who are more tolerant of the changed resource conditions, with the process continuing until a uniform high level of services and facilities is provided within the natural area. This is the concept of 'recreational succession' – where the very conditions of an area that attract recreational use are inevitably changed by that use (Prosser 1986).

The Recreation Opportunity Spectrum (ROS) as a standard planning tool in natural areas was first developed by Clark and Stankey in 1979. The Department has adapted ROS and proposes the use of 'visitor management settings' to manage recreational succession in natural areas to provide the greatest range of recreation opportunities in a given area, while limiting unintended incremental development. The establishment of visitor management settings across the Shark Bay area contributes towards minimising visitor impacts through

preventing recreational succession at sites and incremental development of natural areas beyond a specified level.

The five setting classes used are, from most to least developed, 'Highly Modified, Recreation, Natural-Recreation, Natural and Wilderness (see Appendix 7). These are applied according to assessment against six standard criteria:

- access standards and type of transport required/used;
- the degree of site modification (i.e. the extent, type and design of infrastructure, facilities and amenities);
- density of users and degree of social interaction;
- probable recreation experiences;
- degree of self-reliance required; and
- the level of on-site management, site constraints and regulations.

The system of visitor management settings is to guide the Department and the Conservation Commission in determining what sort of recreation development may be appropriate within the settings. It is important to note that the allocation of a part of the planning area to a particular setting does not necessarily mean the full extent of the setting has to be met. Map 5 shows how these settings have been applied to the Shark Bay area (including the planning area) and include both existing and proposed recreation sites.

It should also be noted that this system of visitor management settings in itself does not consider the impact of proposed recreation developments on the biodiversity and natural values of the planning area. Visitor management settings have been used to ensure that recreation development proposals initially provide the greatest range of recreation opportunities in the planning area, yet limiting incremental development. As an additional process, a general assessment of recreation development proposals and their impact on the natural values of the planning area was made to ensure that recreation development does not occur in areas that are particularly sensitive. Much more detailed environmental impact assessment will be carried out as part of the detailed site planning that occurs for each of the proposals outlined in this management plan.

Recreation Planning and Site Hierarchy

A recreation site hierarchy is used in conjunction with the Visitor Management Settings where it is specifically desired not to develop all sites within an area to the full extent of the setting. It provides a controlled (site by site) mechanism to cap the level of development and maintain a diversity of experiences within a setting.

The draft *Visitor Service Plan* for the Shark Bay area has been prepared to document, assess and provide management direction of recreation use, the level of facilities, communication requirements and tourism development across the Shark Bay World Heritage Property (SBWHP). This plan proposes a system of management by zones, precincts and sites, each with recommendations compatible with the overall vision for the planning area and vision for each respective visitor management zone (see *Vision* and the introduction to this Part). The plan provides a framework for integration of recreation planning and management across the marine and terrestrial estate. The draft Visitor Services Plan covers a range of tenures and land uses in and adjoining the conservation estate. The three primary components of the draft Visitor Service Plan include: recreation; communication; and tourism. The draft Visitor Services Plan is a non-statutory document and sits underneath this management plan. This management plan provides the broad strategic direction for the management of visitor services in the planning area, whereas the draft Visitor Services Plan provides a greater level of detail regarding development proposals within each of the existing and proposed reserves.

30 – Recreation Use Planning

Key Points

- The planning framework adopted to manage recreation use across the planning area is a combination of visitor management settings and a classification of recreation sites according to an established site hierarchy.
- The intent of visitor use planning is to limit the unintended incremental development of parts of the planning area and to ensure the impacts on the environment are managed within acceptable limits and protect the natural and cultural values.
- Planning for recreation in terrestrial and marine areas needs to be complementary.

The objective is to provide visitors with a range of nature-based experiences within the planning area whilst ensuring the environmental impacts are managed within acceptable limits.

This will be achieved by:

1. ensuring future recreational development and use is consistent with the visitor management setting and the recreation site hierarchy as shown on Maps 5, 6, 7 and 8 and Appendix 7.
2. referring any future recreational developments or non-conforming use that will be inconsistent with the visitor management setting to the Conservation Commission for approval; and
3. maintaining a range of driving, day use, camping and other recreation options (i.e. size and social conditions) across the planning area.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
30.1 The range of visitor management settings over the life of the plan.	30.1 No recreation development or use inconsistent with the visitor management setting without approval of the Conservation Commission.	After five years.

31. RECREATION AND TOURISM OPPORTUNITIES

Regional Recreational Context

Shark Bay is a remote destination and Monkey Mia, the main attraction, is about 155 km from North West Coastal Highway. Although a high standard two-wheel drive vehicle access connects the Highway with the major tourist destinations of Hamelin Pool, Nanga Resort, Denham and Monkey Mia, two-wheel drive access into some of the more remote destinations is not catered for. Therefore, providing two-wheel drive access to some destinations is a strong driver for future use and development. The Shark Bay area contains many opportunities for pursuing four-wheel driving and camping in remote, natural environments.

The planning area is located within the Department's Midwest region, Tourism Western Australia's Gascoyne and Midwest regions and Australia's Coral Coast marketing area. The location and size of the parks and reserves in the planning area, make them an important resource for recreation and tourism opportunities in the region and for the local communities of Carnarvon and Denham, in particular. The recreation and tourism opportunities provided in the planning area needs to be consistent with the purpose of that park or reserve.

Shark Bay has one of the most significant terrestrial and marine ecosystems in the world which contributed to its listing as a World Heritage Property. The seascape and arid landscape of Shark Bay, combined with the many peninsulas, islands and bays, creates a great diversity of landscapes with some exceptional coastal scenery. Most notable of these are the Zuytdorp Cliffs, Dirk Hartog Island, Peron Peninsula, and Heirisson and Bellefin Prongs whilst other significant features include the wide sweeping beaches of shells, the inundated birridas, the strongly contrasting colours of the dunes, cliffs and the adjoining seas.

Shark Bay has a vast array of places with unique character and identity, it contains a high concentration of significant natural and cultural features, many of state, national and international significance, and offers a range of opportunities for people wishing to experience the special nature of the area (CALM 2001). It is well known for its rich marine life in particular dolphins, presence of threatened and unique native fauna, sheltered waters, spectacular coastline, sandplains and early exploration and settlement history. As such, it is promoted as an icon destination of Western Australia.

People are attracted to the Shark Bay area for a variety of reasons and respond to the natural and cultural features of the area in a variety of ways, which is reflected in the opportunities provided, the activities they undertake and the different types and patterns of existing development (CALM 2001). Recreation opportunities within the Shark Bay area are varied and numerous, although many are nature-based and include scenic driving, sight-seeing, relaxing, four-wheel driving, cycling, bushwalking, camping, picnicking, boating, sea kayaking, fishing, swimming, surfing, snorkelling, bird watching and scenic flights.

Existing tourism development and built accommodation is focussed on nodes such as the major towns of Carnarvon and Denham and destinations such as Hamelin Bay, Nanga, Monkey Mia and to a lesser extent Dirk

Hartog Island. To retain the remote and natural experience, tourist developments need to remain within these tourist nodes unless a desired experience is not catered for. Outside these nodes and at the other end of the accommodation spectrum, bush camping with basic facilities is provided. The planning area has the capacity to provide alternate built accommodation opportunities such as safari or up-market camping.

The *Shark Bay World Heritage Property Landscape Study* (CALM 2001) highlights how the aesthetic values of the Shark Bay area are a vital component of people's enjoyment of the environment. For both local people and visitors, these values are a strong influence on their sense of well-being and quality of life. The aesthetic values underlie the recreation and tourism opportunities for the area and as such are a major contributor to the economic prosperity and social fabric of the region.

Tourism Western Australia's (TWA) *Strategic Plan 2008-2013: Building the Future* (Tourism WA 2008) identifies the need to develop, promote and protect the State's iconic tourism experiences. This will provide the platform for increased competitiveness, viability and profitability for the WA tourism industry. There is now increasing yield from tourism rather than simply growing the numbers, and there is increasing recognition of the need to consistently address and meet triple bottom line sustainability objectives. Tourism WA has established Destination Development Strategies for each of the five tourism regions within the State. The objective is to focus regional development resources on enhancing tourism product in iconic experience areas. The *Australia's Coral Coast Destination Development Strategy: An action approach* (Tourism WA 2007) recognises the importance of the Shark Bay area and the World Heritage Property as a premium tourism destination that can be marketed nationally and internationally. Research conducted for the Coral Coast as part of producing this strategy identified the following most well known experiences: marine eco/nature-based tourism; relaxing water-based holidays; active water-based holidays; fishing safaris; and wildflower discoveries. Australia's Coral Coast is seen as having the potential to appeal to all markets and attracts significant international interest. The Shark Bay area has strong iconic significance but there is a requirement for improvement to market readiness. According to this document, some of the key gaps that need to be addressed include a lack of transport to the area, a lack of top range accommodation and a lack of non-aquatic activities.

The character of the Shark Bay area is based on its natural attributes and outstanding natural beauty, especially the coastal environment. Visitor expectations can best be catered for by providing experiences in remote settings that are sympathetic to the natural environment. Opportunities exist for providing wildlife tourism experiences in both terrestrial and marine environments.

Recreation activities in the Shark Bay area are concentrated on coastal areas—areas of high scenic value and where a combination of recreation opportunities are available. Most recreational activity in Shark Bay is focussed on Monkey Mia and Shell Beach Conservation Park, and, to a lesser extent, Francois Peron National Park. Other favoured destinations are the west coast of South Peron, Hamelin Pool and Nanga. Despite its remote location and difficult four-wheel drive access, a significant number of people visit Steep Point. The coastline of Tamala and Carrarang stations provide basic camping opportunities.

If unmanaged, recreational activities can result in various localised impacts including the trampling and loss of understorey plants, soil compaction and erosion, removal of both live and dead vegetation for campfires, polluting and littering. Shark Bay is recognised by visitors as having very little litter and this feature needs to be reinforced. These impacts can be minimised through careful site selection, facility placement and design, and the provision of alternative cooking facilities. Whilst some provision will be made for rubbish collection, there will be an emphasis on encouraging visitors to take their rubbish home or to approved disposal sites.

The Tourism WA three year average (2005-2007) visitor survey results for Shark Bay showed that 49% were from intrastate, 17% from interstate, with 34% international. Holiday or leisure was by far the most common purpose to visit the area. Seventy-seven percent of domestic visitors recorded holiday/leisure as their purpose for visiting the area whilst 99% of international visitors suggested that holiday/pleasure was their reason for coming. Caravan or camping was accommodation for 41% of domestic and 36% of international visitors. Most (74%) of all visitors used a private car or company vehicle to get there (Tourism WA 2008).

Visitor Numbers and Trends / Patterns of Use

Visitor numbers are monitored at a number of Department-managed reserves including Monkey Mia, Francois Peron National Park and Shell Beach Conservation Park. In addition the number of visitors to Steep Point and Dirk Hartog Island are recorded. Visitor numbers to Department-managed sites such as Peron Homestead, Hamelin Pool and Shell Beach have fluctuated in recent years. This may be due to a number of reasons, including problems with traffic counters. Visitor numbers to Steep Point have shown a steady increase. Further

information about visitor numbers to Francois Peron National Park, Shell Beach Conservation Park, Hamelin Pool and Steep Point can be found in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula* and 43 – *Edel Land*.

31 – Recreation and Tourism Opportunities

Key Points

- Visitors value the unspoilt surroundings, coastal scenery, fishing, wildlife (both marine and terrestrial) and sense of remoteness of the natural environment in the planning area.
- The provision of recreation and tourism opportunities, facilities and services in a given area should consider what is provided in neighbouring areas to allow the greatest diversity of opportunities and avoid duplication.
- Overall, visitation to sites in the area has not varied much in last 5 years, although, in some areas, visitation has increased.

The objective is to provide visitors with a range of nature-based recreation and tourism opportunities within the planning area that facilitate their enjoyment, understanding and appreciation of the key values.

This will be achieved by:

1. ensuring recreation and tourism developments within the planning area are designed to minimise environmental impacts and are consistent with policy and visitor management settings for the area;
2. avoiding duplication of recreation and tourism opportunities across the planning area;
3. liaising with Regional Tourism Associations, especially in relation to the provision and exchange of information;
4. monitoring visitor numbers and their environmental impacts across a range of sites in the planning area including sites in the proposed reserve additions to determine sustainable visitor capacity at key sites;
5. monitoring visitor satisfaction across a range of activities and sites in the planning area;
6. undertaking social research, including the Department's Visitor Satisfaction Survey and Visitor Statistics Program and projects nominated through the Nature Based Tourism Research Reference Group (see Section 57 – *Research and Monitoring*); and
7. encouraging the development of major tourism infrastructure outside the planning area and focusing on the provision of opportunities within the planning area that cannot be catered for elsewhere.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
31.1 Visitor satisfaction levels of nature-based experiences.	31.1 Visitor satisfaction levels of nature-based experiences are maintained or increased from 2012 levels.	Annually.

32. VISITOR ACCESS

Most lands and waters entrusted to the Department are available for public use where this use is consistent with the primary purpose of the reserve and conserving its natural values and biodiversity. The planning area has a high level of accessibility, with public access available to two and four-wheel drive vehicles via sealed and unsealed roads and tracks. The majority of the planning area can only be accessed by four-wheel drive vehicles. Public access is also available to most parts of the coastline by boat and there are a number of airstrips in the area previously used in pastoral operations. Demand for access to the planning area comes from a variety of sources:

- visitors and local residents who want good quality access to their favourite areas;
- commercial operators (e.g. fishing and tour) wanting access to parts of the planning area;
- service providers who require access to maintain infrastructure;
- different recreational users wanting different types of access; and
- managers who require access for management purposes.

Vehicle Access

Vehicle access is one of the key issues affecting management of the planning area. Most of the existing access tracks were cleared for pastoral purposes, have developed on an unplanned basis over many years, are poorly

located, in poor condition, are difficult to maintain, difficult to rehabilitate and are unsuitable for recreation and conservation purposes. Much of the coastline in the Shark Bay area is sensitive to erosion, with large areas of dune-fields and occasional areas of unconsolidated wind-blown sand. Many tracks traverse sensitive landforms such as birridas, steep dunes and coastal fringes, and visitor traffic has accelerated landform degradation at many sites. Some of the beaches are habitats for breeding birds and turtles and vehicle use on these beaches can damage nests during the breeding season. Many coastal areas contain sites of Aboriginal occupation and are sensitive to damage. Also many of the tracks present risks to visitor safety.

Across the planning area, it is proposed to rationalise vehicle access by defining, realigning or stabilising designated routes, and closing and rehabilitating tracks which are not required. Minor road works and track rationalisation are necessary to protect and rehabilitate coastal sites due to factors such as duplication of tracks, erosion, degradation of scenic quality, avoidance of sensitive landforms, increased numbers of vehicles and visitor safety. The main considerations in determining the proposed road system are:

- the location and attraction of features at existing and potential destinations and recreation sites;
- interpretive opportunities;
- the protection of visual qualities and scenic opportunities along existing and proposed alignments;
- the capacity for landforms, soils, species and communities to sustain visitor access;
- the condition, safety and environmental impacts of existing roads;
- visitor needs, expectations and management requirements;
- feasibility and cost of construction and maintenance; and
- access requirements for management, such as for research, safety and fire management.

In addition, the implementation of the Dirk Hartog Island ecological restoration project (see Section 21 – *Native Fauna*) will result in a higher level of management for visitors accessing the island, particularly in relation to hygiene requirements.

'Dedicated' roads are defined under the *Road Traffic Act 1974* (any highway, road or street open to, or used by the public), Land Administration Act (reserved, declared or otherwise dedicated as a road, street or thoroughfare) and the *Local Government Act 1995* (public thoroughfare dedicated for public use). Where dedicated roads pass through land managed by the Department, the road remains Crown land road reserve. Roads constructed and maintained on Department managed lands and which are open to the public are best described as 'CALM Act roads'. Parts of these roads or tracks may be closed to the public by signage or barriers. Any vehicle registered under the *Control of Vehicles (Off-road Areas) Act 1978* is not permitted to operate in the planning area except under exceptional circumstances with permission from the District Manager (such as four-wheel drive bikes that can facilitate disabled person access). 'Off-road' driving includes accessing roads and tracks closed to the public or driving in areas where there are no roads, for example, beaches. The use of unregistered off-road vehicles[12] (e.g. ATVs, off-road motorbikes and dune buggies) is currently not permitted in the planning area. For the life of this plan this prohibition will remain in place and include proposed reserve additions.

Some tracks may be designated for management purposes only and therefore not available to public access. These roads will generally be primarily for management operations, such as for pest-animal baiting, fire management, flora and fauna monitoring, maintenance, weed control, strategic access for conservation or for evacuation purposes although some access for nature based tourism may be permitted. Conceptual new road realignments are shown in Maps 6, 7 and 8. Access roads and tracks available for public use are shown in Tables 7, 11, 14 and 18 in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island* and do not include management tracks. Other roads/tracks may be made available as demand increases and after detailed planning, review of the management setting implications and public consultation. Options for roads and tracks not listed in Tables 7, 11, 14 and 18 include closing, rehabilitating or being retained for management access only.

Two-wheel Drive Access

A sealed road connects North West Coastal Highway to Hamelin Pool, Nanga, Denham and Monkey Mia. A formed, gravel road connects Useless Loop. As most visitors to Shark Bay travel in private two-wheel drive vehicles, there is increasing demand and justification for providing more two-wheel drive access in the planning area, particularly to remote coastal areas. The provision of two-wheel drive roads would enable more equitable access to the planning area for visitors and greatly enhance the region's tourism opportunities.

Specific details about two-wheel drive access in Peron Peninsula are provided in section 40 – *Peron Peninsula*..

[12] As permitted under the *Control of Vehicles* (*Off Road Areas) Act 1978.*

Four-wheel Drive Access

Many four-wheel drive users are attracted to the isolation, peaceful bush settings, scenic driving opportunities and sense of freedom associated with travelling on tracks that, by virtue of the more difficult access, are less visited and offer a different quality of experience. Typically these tracks include scenic viewpoints, rugged landscapes and picturesque settings.

The capacity of some landforms, soils, species and communities of some parts of the planning area to sustain moderate levels of vehicle access is limited. The environmental damage caused by the current level of usage of some tracks (primarily by inappropriate or inexperienced four-wheel drive use) is not sustainable or appropriate and cannot continue. Some beach driving may require definition to ensure this type of access does not traverse sensitive landforms or habitats. Some four-wheel drive tracks that traverse parts of Steep Point and Dirk Hartog Island are constantly being modified by wind and water and travel can become difficult, dangerous or access may be cut off by natural dune movement. These tracks are irregularly monitored and several days may pass before they are inspected. To maintain visitor experience, reduce visitor risk, protect habitat and threatened species, prevent erosion, access may need to be managed by improving track definition, installing signage, realigning tracks, permanently or seasonally closing tracks, hardening sites or implementing the use of a permit system. In addition there may be safety reasons for realigning or closing tracks. Therefore the tracks listed in Tables 7, 11, 14 and 18 and Maps 6, 7 and 8 will be provided for public vehicle access and all other tracks will be for management access or closed and rehabilitated.

In August 2006 the Department signed an MOU with Tread Care WA and the WA Four Wheel Drive Association. As part of this, the 'Australian National Four-Wheel Drive Council's On and Off Road Code of Ethics' was adopted. Adopting and promoting this code of ethics for the Shark Bay area with some additions to reflect local conditions would encourage appropriate behaviour and be a useful educational tool. Continuing to educate users on the appropriate techniques for four-wheel driving in the planning area (e.g. engaging four-wheel drive when necessary, reducing tyre pressure in sensitive landforms such as sand dunes, reducing weights of towed vehicles such as boats and trailers and driving at lower speeds) will help to assist in reducing the impacts of four-wheel drive vehicles.

Specific details about four-wheel drive access in Peron Peninsula, Nanga Peninsula, Zuytdorp Area, Edel Land and on Dirk Hartog Island is provided in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 42 – *Zuytdorp Area*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

Boat Access

Many parts of the marine area are accessible from land. Conversely many of the islands and large parts of coast are accessible by boat. Although boating generally has little impact on the physical environment, areas of land where visitors camp and launch their boats can become degraded. Additionally, boating can disturb fauna at some locations and times of the year such as breeding seasons and there are safety risks associated with boating in the Shark Bay marine area including strong winds and rough seas. For the purposes of this management plan, boat access refers to where boats are launched or land on the beaches of the planning area. It does not include where boats are anchored off-shore and people do not step onto or camp on the land.

Public boat ramps are provided for powered boats at Carnarvon, Denham, Monkey Mia and Nanga. Non-powered boating (in particular kayaking and canoeing) is an increasingly popular activity in the marine park, as non-powered boats can be readily carried to the shoreline from adjacent car parks and require no particular launching facilities. For the most part, both motorised and non-motorised boats are launched from the beach where water of suitable depth is found. Ongoing use of boat launching from beaches at any site will be subject to maintaining visitor safety, protecting natural and cultural values and being consistent with marine park management strategies.

Boat activities have the potential to disturb native fauna and can impact on turtle nesting and bird breeding areas which may be located in the marine or terrestrial environments. To protect natural values, some parts of the planning area may be closed (permanently or seasonally) to boat access whilst other areas may require a permit to enter. The permit system will allow limits to be placed on the number of watercraft and a means for informing visitors on how they can avoid disturbing fauna whilst undertaking such activities.

Specific details about boat access to Peron Peninsula, Nanga Peninsula, Edel Land and Dirk Hartog Island is provided in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

Air Access

Airports exist at Denham and Carnarvon with regular air services connecting Carnarvon and Denham/Monkey Mia to Perth and Geraldton. There is an unsealed airstrip at Useless Loop and basic airstrips on pastoral and former pastoral leases. Within the planning area, one airstrip near Nanga just south of Goulet Bluff and two on Dirk Hartog Island are used. A helipad has been constructed at Cape Inscription adjacent to the lighthouse.

Airstrips in the planning area will need to be adequately constructed and maintained to meet air safety standards before they can be used by park management or the public. Permission has been provided to the operators of the Nanga Resort to use the airstrip near Nanga but this will need to be formalised through a lease agreement. The use and need of this airstrip will be reviewed during the life of this plan.

The upgrade of existing or construction of new airstrips in the planning area will require an environmental impact assessment and careful consideration of a number of factors including:

- impacts on key values, World Heritage and national heritage values;
- visitor safety issues associated with landing and take off;
- requirements for rescue and evacuation of visitors;
- the compatibility of the airstrip with character of place and visual landscape;
- the potential level of use;
- the economic return on the investment to construct airstrip;
- maintenance requirements and responsibility;
- proximity to visitor services;
- impacts on threatened native flora and fauna;
- impacts of clearing vegetation;
- visual impact of airstrip;
- noise impacts on fauna and visitors;
- the standard of the airstrip to be constructed;
- the physical dimensions and suitability for aircraft;
- the suitability of soils for construction purposes;
- the source of materials required for construction;
- the impact of constructing access to the proposed airstrip; and
- the impacts on cultural, both Indigenous and non-Indigenous, heritage.

Specific details about air access on Peron Peninsula, Nanga Peninsula, Edel Land and Dirk Hartog Island is provided in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

Special Access

Some parts of the planning area may have restricted public access for reasons of safety, cultural sensitivity, disease control, protection of high natural values and water quality, fire management, or maintenance of roads and tracks. Under section 62 of the CALM Act, lands and waters may be classified as "prohibited areas", "limited access" or any other classification to prescribe conditions of use (e.g. day or overnight use) for the protection of natural and cultural values. Several islands and parts of the planning area may warrant access restrictions to protect natural values.

Land Classification

A strategy for the conservation of natural and cultural values and the facilitation of sustainable resource use, is the implementation of a land classification scheme to designate appropriate levels and types of access. Section 62(1) of the CALM Act provides for the classification of land vested with the Conservation Commission into various categories (these are sometimes called zones):

(a) wilderness area;
(b) prohibited area;
(c) limited access area;
(d) temporary control area;
(da) forest conservation area;
(e) recreation area for purpose specified in the notice; or
(f) such other class of area as the Minister on recommendation of the Conservation Commission thinks necessary to give effect to the object of this area.

To enable the application of section 62 of the CALM Act, commensurate changes to the Regulations are required.

Zuytdorp Nature Reserve and adjacent lands have been assessed as meeting wilderness quality criteria (as defined in the Department's Policy Statement 62 – *Identification and Management of Wilderness and Surrounding Areas*, CALM 2004) and is shown in Map 3. At this time it is proposed not to establish a wilderness area in the southern part of the planning area encompassing Zuytdorp Nature Reserve and adjacent lands (see Section 16 – *Wilderness*).

Prohibited areas are those that may not be entered except as authorised by the Chief Executive Officer of the Department, and then only to carry out activities pursuant to the plan. Dorre Island was gazetted as a "prohibited area" in 1970 to prevent disturbance to wildlife. This category may be invoked elsewhere in similar circumstances over the life of the plan.

Limited access areas are those that restrict activities that may be undertaken. In 1970 Bernier Island was gazetted as a "limited access area" which allows for day use but not overnight use. This category may be invoked elsewhere in similar circumstances over the life of the plan.

Temporary control areas (or similar alternative mechanisms available under the CALM Act or CALM Regulations) may be used to provide temporary or seasonal protection to fauna or made for the purpose of public safety for a period not exceeding 90 days. For example, a temporary control area could be used to protect breeding sea/shorebirds or nesting turtles, or close access in the event of a bushfire. The need for use of temporary control areas will be assessed on a case-by-case basis.

The Minister may on the recommendation of the Conservation Commission declare an area to have special access provisions over a place or time. Day use only access to the islands may be declared under section 62(1)(f) of the CALM Act.

Specific details about special access to Bernier, Dorre and Koks Islands, the Shark Bay Islands, Peron Peninsula, Nanga Peninsula, Zuytdorp Area, Edel Land and Dirk Hartog Island is provided in Sections 38 – *Bernier, Dorre and Koks Islands*, 39 – *Shark Bay Islands*, 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 42 – *Zuytdorp Area*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

32 - Visitor Access

Key Points

- Access needs to be carefully managed so it does not compromise the visitor management settings and the sense of being in natural and sometimes remote areas.
- Currently, two-wheel drive vehicle access to the coast is limited to Monkey Mia and some sites on the western coastline of South Peron.
- Four-wheel drive vehicles are required to access much of the planning area and some of the four-wheel drive access tracks traverse sensitive landforms and require realignment, repair or closure.
- Much of the planning area is accessible by boat and boat launching across the beach is provided at a number of sites along the coast.
- Access and services for people with limited mobility is limited and only available at primary destination sites such as Eagle Bluff, Monkey Mia and Peron Homestead.
- Pedestrian and cycling access to the planning area is likely to remain at low levels because of remoteness, lack of surface freshwater and sandy conditions of tracks.
- There are existing and future requirements to restrict access or require a permit to some parts of the planning area for visitor safety reasons and the protection of natural and cultural values.

The objective is to provide a range of access types that do not adversely impact on the key values of the planning area or visitor appreciation of these values and minimises conflict with other users.

This will be achieved by:

1. consistent with the criteria for the appropriate visitor management setting and after consultation with relevant stakeholders, providing public vehicle access on dedicated roads, CALM Act roads and tracks as shown in Maps 6, 7 and 8 and listed in Table 7, 11, 14 and 18;
2. rationalising the multitude of tracks across the planning area and maintaining, upgrading, re-aligning,

closing or rehabilitating tracks as required (see Maps 6, 7 and 8);
3. continuing to prohibit vehicles driving off dedicated roads, CALM Act roads and tracks with the exception of beach access (see below), except by authorised persons in exceptional circumstances, to accommodate a particular event or activity, and subject to approval of the District Manager;
4. continuing to allow beach access for recreational driving in other parts of the planning area where alternative tracks are not provided;
5. maintaining some parts of the planning area as vehicle-free by applying appropriate visitor management settings and/or gazetting restricted access areas as required;
6. in consultation with appropriate organisations, restricting access to sensitive cultural sites such as those associated with shipwrecks and early settlement of the Shark Bay area;
7. developing and distributing information on appropriate behaviour for visitors using four-wheel drive vehicles and those visitors looking for a 'challenging' experience;
8. continuing to work with local, state and national four-wheel drive and off-road vehicle clubs and associations to actively promote responsible vehicle use in the planning area;
9. ensuring 'management vehicle' tracks are effectively closed to the public but permitting limited access where appropriate and subject to approval of the District Manager;
10. initiating notices, under section 62 of the CALM Act and corresponding Part 3 of the Regulations, to implement appropriate land classification schemes including prohibited areas, limited access areas, temporary closures and such other class of area as is necessary with the recommendation of the Conservation Commission; and
11. consistent with the Department's *Disability Access and Inclusion Plan* and where appropriate, improving access, facilities and services for disabled visitors by:
    - considering disabled visitors in the design of new facilities; and
    - ensuring information is accessible, clear, and visible and complies with the required standards.

Key Performance Indicators:
There are no Key Performance Indicators for this section

33. RECREATION ACTIVITIES AND USE

The planning area contains or enables access to several features of World Heritage significance including spectacular coastal scenery, lagoons, birridas, wildflowers, threatened species and a diverse and abundant marine fauna. Opportunities for visitors to view these features and gain greater appreciation and understanding of World Heritage and other key values are provided.

In recent years visitor surveys have been conducted at Monkey Mia and Francois Peron National Park on several occasions (see Section 31 – *Recreation and Tourism Opportunities*). From visitor surveys conducted at Monkey Mia in 2006, the dolphin interaction still rates as the most popular activity. Recreational use across the planning area remains focused on the coastline, particularly in areas where there is one or a combination of the following:

- good access for snorkelling on corals and swimming;
- protection from the prevailing winds;
- easy vehicle access;
- good fishing from both beach and rocky cliff tops; and
- available boat launching.

Consistent with the Department's *Disability Access and Inclusion Plan* and where appropriate, access, facilities and services for disabled visitors will be improved by: considering disabled visitors in the design of new facilities; and ensuring information is accessible, clear, and visible and complies with the required standards.

Planning of the existing and proposed recreation sites indicated in sections on scenic and recreational driving, day use, overnight stays, bushwalking and water-based activities have taken into consideration the marine park zoning and potential impacts on the marine environment as well as terrestrial management issues (see Tables 7-21 and Maps 6, 7 and 8).

33.1 – Wildlife Encounters

Wildlife includes both plants and animals and human encounters with wildlife are controlled by the Wildlife Conservation Act. In the planning area, wildlife tourism is becoming an increasingly popular tourist activity and a wide array of terrestrial and marine wildlife is of interest. In the planning area such encounters include

viewing and photographing wildflowers, viewing terrestrial fauna such as birds, reptiles and mammals and viewing marine fauna such as dolphins, dugongs, sharks, fish and whales from cliff tops or beaches.

Wildlife tourism can have both positive and negative effects on wildlife. Positive effects occur through financial contributions (such as user fees); non-financial contributions (such as participation in management, monitoring and research activities including breeding programs and hunting of introduced animals); socio-economic incentives (such as business for tourism operators, creation of protected areas and shifting attitudes towards supporting conservation management by landholders and local people); and education (such as increased awareness and understanding of wildlife conservation and thus changes in behaviour) (Higginbottom *et al.* 2001b).

It is important to ensure that populations targeted for interaction are not adversely impacted and are provided with the appropriate legislative protection, research and management. It is also important to ensure that tourist operations are modified to minimise the risk of adverse impacts on the animals. Green and Higginbottom (2001) group negative effects of wildlife tourism and related human activities on wildlife into three main categories:

- disruption of activity (such as spotlighting, noisy activities, and tourists approaching animals that are foraging or caring for young) resulting in avoidance behaviour where wildlife will flee, hide, or become habituated to humans;
- direct killing or injury (such as damage from propellers, road kills, hunting or collecting); and
- habitat alteration (such as land clearing or modification including road or walk track construction) leading to significant increases or decreases in population numbers, reduced protection from predators or reduction of prey species.

The planning area contains many interesting and endemic flora and fauna species that are available for viewing including threatened and endemic flora, birds, reptiles and mammals.

Bird watching is an increasingly popular activity and Shark Bay has several threatened and endemic bird species. Several sites are known to contain colonies of roosting and breeding seabirds such as pelicans, terns and cormorants. These areas offer opportunities to view large numbers of birds in one location. However the movement of vehicles, boats and diving can disturb these colonies, resulting in eggs and hatchlings being taken by predatory birds. Restrictions on visitor access to and around these areas during breeding periods may need to be introduced. Constructing appropriately designed facilities such as bird hides may be provided at roosting areas to enable visitors to view fauna whilst minimising disturbance.

Viewing wildlife is a popular activity on the Peron Peninsula. Viewing the dolphins that visit the shore at Monkey Mia is an important activity for visitors and opportunities are provided to view marine wildlife at Skipjack Point at Cape Peron and Eagle Bluff in South Peron (see Section 40 – *Peron Peninsula*).

The management of visitors around turtle nesting sites on Dirk Hartog Island and Edel Land is important. Restrictions on visitor access to and around these areas during breeding periods may need to be introduced (see Sections 43 – *Edel Land* and 44 – *Dirk Hartog Island*).

33.1 - Wildlife Encounters

Key Points

- Viewing wildlife is a popular activity in both the marine and terrestrial environment.
- Wildlife commonly viewed by visitors in the planning area include terrestrial species such as birds, reptiles and marine species that can be viewed from the shore such as dolphins, stingrays, dugongs, sharks and fish.
- Potential impacts of wildlife encounters include the possible disruption of activities (e.g. feeding, breeding), direct injury (e.g. road kills) and habitat alteration.

The objective is to provide opportunities for sustainable wildlife encounters within the planning area that facilitate visitor enjoyment, appreciation and understanding.

This will be achieved by:

1. providing further specific wildlife viewing opportunities that can increase visitors' enjoyment of the planning area and awareness of wildlife conservation issues whilst preventing disruption of wildlife activities, direct injury, and habitat alteration;

2. continuing to provide opportunities for wildlife encounters that is sustainable and does not have a detrimental impact on the biology and reproductive capacity of the wildlife;
3. promoting Shark Bay as a destination where visitors can view a wide variety of endemic and special marine and terrestrial wildlife;
4. developing on-site facilities to view wildlife, such as bird hides and viewing platforms and providing opportunities to view wildlife off-site using technology such as remote cameras;
5. ensuring tour operators that conduct wildlife interaction experiences are appropriately licensed and accredited (see Section 34 – *Tourism and Commercial Operations*);
6. continuing to monitor visitor satisfaction with wildlife interaction including dolphins;
7. conducting and supporting research and monitoring of turtle encounters; and
8. providing education, interpretation and information on the protocols for wildlife interaction and wildlife feeding and its consequences.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

33.2 – Scenic and Recreational Driving

Driving for pleasure and sightseeing on roads and tracks is a popular recreational pursuit and, in the Shark Bay area, could be further promoted through the development of specific drives. Some four-wheel drive clubs regularly volunteer their time to environmental projects in parks and reserves, to rehabilitate tracks, clear rubbish and remove weeds, and this will be encouraged in the planning area. Unfortunately, there are still many recreational drivers who visit parks and reserves that are not aware of, or ignore, the need to minimise environmental impacts.

It is important that any scenic and recreational driving within the planning area complies with the Conservation and Land Management Regulations to avoid damage to the environment, damage or injury to visitors and their vehicles and minimise conflict with other users. All vehicles within the planning area must be registered under the *Road Traffic Act 1974,* and all drivers must possess a current driver's licence. The relevant road rules, such as not driving under the influence of alcohol or drugs and not using excessive speed, also apply.

Generally, scenic drives are built to a standard capable of accommodating two-wheel drive vehicles. Much of the experience and enjoyment that visitors gain from the arid and adjoining marine environments is derived from two-wheel drive routes in areas of high scenic quality such as the Shark Bay and Monkey Mia Roads. These roads should be promoted as part of a world heritage tourist drive interconnecting recreation sites (see Section 55 – *Information, Interpretation and Education*). In preserving the inherent scenic values of all public travel routes, selected roads that have important scenic values and which afford outstanding views of surrounding landscapes may be identified, promoted and managed as scenic drives (see Maps 6, 7 and 8).

Many owners of four-wheel drives seek 'adventure' or 'challenging' driving experiences within the planning area (see Section 32 – *Visitor Access*). Although it may appear that sand dunes and beaches across the planning area are not adversely affected by off-road driving, the vegetation and some landforms such as birridas and inter-tidal areas are very sensitive to damage from four-wheel drive vehicles. In addition, visitors who venture off marked tracks place themselves and their vehicles at risk. The Department will consider a range of options to minimise environmental impacts and visitor risk including improving signage, realigning tracks or closing tracks.

Specific scenic drive trails are proposed in Francois Peron National Park, in South Peron, in the proposed Edel Land National Park and in Dirk Hartog Island National Park (see Sections 40 – *Peron Peninsula*, 43 – *Edel land* and 44 – *Dirk Hartog Island*).

The use of four-wheel motorbikes and trail motorbikes for off-road riding and accessing beaches for fishing or travel is increasing. If undertaken off CALM Act roads or management tracks, such activities can have a negative impact on the environment by damaging vegetation, encouraging soil disturbance, can place visitors at risk and can degrade the aesthetics of a natural and remote environment. Off-road riding will not be permitted within the planning area.

Licenced motorcycle and trail bikes will be permitted to use the roads and tracks open to the public within the planning area. These are shown on Maps 6, 7 and 8. Roads and tracks that are closed except for management vehicles only, will be signposted in the field and will not be open for use by motorcycles, enduro riders, or any other vehicles (see Section 32 – *Visitor Access*).

33.2 - Scenic and Recreational Driving

Key Points

- Visitors to the planning area seek opportunities for both scenic and recreational driving and destination-based access.
- Scenic driving for pleasure and sightseeing on roads and tracks is a popular recreational pursuit.
- The planning area provides many opportunities for challenging recreational driving experiences.
- Recreational and off-road driving can cause damage to the environment if carried out in an inappropriate manner.
- To protect vegetation, visitor safety and enjoyment, recreational driving needs to be controlled in sand dunes and beaches.
- All vehicles must be registered and drivers must be licensed.

The objective is to provide opportunities for scenic and recreational driving within the planning area that does not cause damage to the environment, is safe and minimises conflict with other users.

This will be achieved by:

1. requiring any motorised vehicle used in the planning area be appropriately registered;
2. promoting scenic driving routes in conjunction with tourism groups;
3. developing recreational driving loops in parts of the planning area;
4. ensuring scenic and recreational drives are consistent with the appropriate visitor management settings;
5. maintaining some parts of the planning area as vehicle-free by instituting appropriate visitor management settings and/or gazetting restricted access;
6. monitoring vehicle numbers and environmental impacts and, if required, developing alternative strategies to limit vehicle numbers and impacts;
7. providing information and educating four-wheel drivers, motorcyclists and those looking for 'challenging' driving experiences about the impacts on the environment and actions that can be taken to minimise these impacts through development of a 'code of ethics' for this activity; and
8. continuing to work with local, state and national four-wheel drive and off-road vehicle clubs and associations to actively promote responsible use in the planning area.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33.3 – Overnight Stays

Many people stay overnight in attractive surroundings on lands managed by the Department. Overnight stays may be catered for by built accommodation or through the provision of camping facilities, some of which attract fees.

Built Accommodation

Built accommodation is readily available adjacent to the planning area in Denham, Monkey Mia, Nanga, Hamelin Pool and Dirk Hartog Island Homestead. There is a range of accommodation including motels, hotels, self-contained units, chalets, homesteads and caravan parks. Directing visitors to use facilities outside the planning area may economically benefit these enterprises and tourism within the region. However, there may be demand for accommodation in the natural environment (known as nature-based accommodation) which provides a different experience to staying in settlements. This low impact, nature-based accommodation is not currently provided for within the Shark Bay area and would be an added attraction.

One type of nature-based accommodation, eco-accommodation refers to accommodation built in a natural setting that is well integrated into the natural landscape, relies on renewable energy resources, is built with environmentally sensitive materials, manages waste in a sustainable manner and involves local communities during the planning, development and operational stages. Nature-based accommodation can include safari camps and eco-lodges. These are all defined in the Glossary.

A whole of Shark Bay approach should be taken in identifying sites for providing low impact, nature-based accommodation. The Department aims to only provide accommodation opportunities that are not otherwise

provided outside the planning area. Such accommodation may be provided by the Department or a commercial operator (see Section 34 – *Tourism and Commercial Operations*). Not all sites identified will be developed nor should they provide the same style and standard of accommodation. Any built accommodation to be provided on Department-managed lands will undergo a more detailed planning, site assessment, proposal evaluation and public consultation process. There are several key management issues that should be considered regarding the types of accommodation provided within the planning area:

- the impact of the accommodation on the natural and cultural values;
- the impact of the accommodation on the visual landscape;
- the environmental health risks associated with sewage and household disposal;
- the safety of visitors;
- compliance with building codes;
- equity for visitors to the planning area;
- the economic viability of the development;
- the role the accommodation plays in providing a different recreational opportunity for different types of visitors; and
- the impact of the vehicular access and parking requirements associated with the accommodation.

The establishment of low impact, nature-based accommodation at various locations across the planning area has been suggested in a number of past documents. The planning area contains several potential development sites that could offer a range of different types of accommodation. The range of built accommodation to be considered include basic three-sided structures of varying styles and standards suitable for campers, or more developed facilities such as enclosed huts, safari tents, lodges or chalets. Other more basic shelters may also be considered to support long-distance walking in the planning area (see Section 33.5 – *Recreational Activities and Use - Bushwalking*). Built accommodation will need to be located within the more developed visitor management settings of the planning area (see Section 30 – *Recreation Use Planning – Visitor Management Settings*). The low impact, nature-based accommodation requires special care in design, construction, operation and the utilisation of sustainable materials and services. Should there be appropriate demand, any accommodation development in the planning area should be located in an appropriate visitor management setting and provide unique experiences and opportunities for visitors.

Specific details about built accommodation in the Francois Peron National Park, the Zuytdorp Area and on Dirk Hartog Island are provided in Sections 40 – *Peron Peninsula*, 42 – *Zuytdorp Area* and 44 – *Dirk Hartog Island*.

Camping

Camping is a popular activity within the planning area, allowing visitors to relax and develop an awareness, appreciation and understanding of the natural environment. The majority of campsites in the planning area have few or basic facilities and offer a similar experience.

Campsites, some with facilities, exist at Francois Peron National Park, South Peron, Nanga Peninsula, Edel Land and Dirk Hartog Island National Park. Most of these sites require four-wheel drive vehicles to access them and facilities are generally basic with toilets and sometimes gas barbeques and furniture (see Maps 6, 7 and 8 and Tables 8, 12, 15 and 19).

Important issues associated with managing campsites include:

- the impact on natural values such as breeding and nesting fauna (see Part C – *Managing the Natural Environment*);
- the impact on visual landscape values (see Section 37 – *Visual Landscape*);
- the impact on significant cultural heritage values (see Part D – *Managing Our Cultural Heritage*);
- the difficulties associated with managing and maintaining semi remote campsites, particularly in coastal areas;
- exclusive use of campsites by visitors who have used sites for many years;
- minimising conflicts with day users;
- provision of suitable camping areas and facilities (both in terms of environmental impact, site stability and in meeting visitor needs);
- campsite expansion and an increase in the number of informal campsites;
- soil disturbance, compaction and the risk of erosion;
- loss of vegetation;
- the use of generators;
- use of huts by campers;

- waste management and the provision and maintenance of toilets in remote locations;
- risk to water quality from activities associated with camping;
- use of campfires including the environmental impact of vegetation loss, reduction in habitat integrity, the spread of disease, possible changes to nutrient balance of ecosystems and the risk of bushfires from campfire escapes; and
- change towards a more developed visitor management setting if campsite development were to occur.

Many of the informal campsites do not have any facilities, have limited maintenance and may have a high intensity of visitor use, particularly during the peak periods. At some existing campsites it may be necessary to redesign the area or limit access/visitor numbers at particular campsites in order to protect the environment and visitor experience. Campground hosts may be required at some campsites and, where these issues are too difficult to manage, some campsites may need to be permanently closed.

Fundamental to the success of the proposals to better manage camping is the introduction of a booking system. A booking system for camping currently exists for Edel Land and Dirk Hartog Island National Park (see Section 43 – *Edel Land* and Section 44 – *Dirk Hartog Island*). The Department is currently developing such a system for a number of parks as a trial, with a view to introducing it State-wide. This will allow visitors (both individuals and groups) to visit the planning area with the surety of obtaining a site during busy periods (in particular school holidays). It is proposed that the system will allow for on-line booking.

If not managed appropriately, camping can have a detrimental impact on the natural environment and result in a negative visitor experience. Camping in coastal areas can impact on breeding birds and nesting turtles, reduce vegetation and result in soil disturbance.

The development of campsites only accessible by boat (that is, no vehicles) in some parts of the planning area may be appropriate. Specific sites along the eastern coastline of Dirk Hartog Island National Park, Edel Land, Nanga Peninsula and South Peron could be developed as boat only camping destinations, which would provide a unique opportunity for people visiting the area. However, there is limited knowledge of the extent and frequency of visitors accessing camping areas by boat and boat surveys will need to be conducted before any specific campsites can be developed, to determine levels of use and visitor needs.

For the most part, open fires are not allowed on Department-managed lands in the planning area. Alternatives such as fuel stoves and gas barbeques will be promoted as they are more efficient, quicker and cleaner for cooking and are ideally suited for remote areas. Campfires have detrimental impacts, from the collection of firewood, the fire itself or the risk of bushfire (see above points). The area around fireplaces can also suffer from the accumulation of ash and the failure of groundcover to regenerate where there have been continuous campfires. Hot ash and coals left on beaches after campfires can also be a health and safety risk to other beach users. However, for many, campfires are a traditional part of the camping experience. Lighting campfires is also affected by restricted and prohibited burning seasons, which are regulated by the Shire of Shark Bay, in conjunction with FESA. Campfires for cultural, community education and interpretation purposes will continue to be allowed within the planning area, with the permission of the District Manager.

At the more remote campsites, generators are used by visitors who stay for several days. The noise from generators can cause conflict with other park users and may need to be managed by separating users or restricting the times when or locations where generators can be used.

Some visitors may be inclined to stay for several days or even weeks which can impact on the opportunity for other visitors to use and enjoy the campsite, particularly during peak periods. If length of stay becomes a major issue, time limits may need to be implemented.

Camping associated with motorised and non-motorised (e.g. sea kayaking) boats occurs across the planning area. Specific locations with appropriate facilities may be identified and set aside for this activity to ensure there are no negative impacts upon the natural and cultural values. A permit system with conditions such as minimal impact camping may be required.

Specific details about camping on Peron Peninsula, Nanga Peninsula, Edel Land and Dirk Hartog Island National Park are outlined in Sections 40 – *Peron Peninsula,* 41 – *Nanga Peninsula,* 43 – *Edel Land* and 44 – *Dirk Hartog Island*

Proposals for camping in the planning area acknowledge that a range of camping opportunities is appropriate, providing visitors with more diversity and choice, and allowing visitors to be directed away from sites unable to

sustain heavy use. Five types of campsites have been described for the planning area: wild (remote), beach, minor, medium and major camping. The camping areas within the planning area have been described according to these types, the level of development and the management setting (see Tables 8, 12, 15 and 19 in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*). Other camping areas may be developed as demand increases and after detailed planning, review of the management setting implications and public consultation.

33.3 - Overnight Stays

Key Points

- There are opportunities to develop low impact, nature-based accommodation at various sites within the planning area and outside the planning area on privately operated tourist destinations.
- Within the planning area, there are many unplanned campsites with minimal or no facilities that have been degraded through over use and inadequate site planning.
- Within the planning area there are many campsites where uncontrolled beach camping occurs, which has a detrimental impact on the surrounding natural environment.
- Gas BBQs are used for cooking.
- Currently, there are no two-wheel drive-accessible campsites, with basic facilities, in coastal areas.
- There is a range of booking systems for managing camping across the planning area.

The objective is to provide opportunities for visitors to stay overnight within the planning area in appropriately designed built accommodation and campsites, and that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing opportunities for a range of built accommodation that is consistent with the appropriate visitor management setting and as resources permit (see Tables 8, 12, 15 and 19 and Maps 6, 7 and 8);
2. ensuring built accommodation is:
   - built to a safe structural standard;
   - environmentally sensitive and energy efficient;
   - ensures a sense of place and reflects vernacular architecture;
   - low maintenance; and
   - fire resistant.
3. continuing to apply a booking system for existing sites and expanding this throughout the planning area;
4. providing a range of camping opportunities with varying physical, structural and social facilities and managerial conditions at coastal sites as listed in Tables 8, 12, 15 and 19 and Maps 6, 7 and 8;
5. restricting access to and rehabilitating any campsites impacted by inappropriate, overuse or where campers are causing environmental impacts such as disturbing nesting turtles and damaging soils, as required;
6. phasing out the use of firewood, except for cultural, community education and interpretation purposes with the approval of the District Manager, and promoting the use of alternatives such as fuel stoves and gas barbeques;
7. charging camping fees according to Department guidelines;
8. developing permit conditions for boat camping (both motorised and non-motorised) to ensure protection of natural and cultural values;
9. considering applying a maximum length of stay at particular sites if this becomes an issue within the life of the management plan;
10. investigating opportunities for partnerships with commercial operators to provide built accommodation and camping within the planning area (see Section 34 – *Tourism and Commercial Operations*);
11. developing protocols for visitor interaction with wildlife including nesting turtles and breeding birdlife;
12. developing protocols for low impact camping for visitors accessing remote parts of the terrestrial estate by boat, sea kayak or foot; and
13. providing information to visitors about the location of campsites, facilities available and fees to be charged to the public.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
33.1 The use of undesignated camping areas.	33.1 The use of undesignated camping areas decreases over the life of the plan.	Annually

33.4 – Day Use

A day use area is any recreation site that is designed specifically for day visits only. This includes picnic and barbecue sites, lookouts, interpretive stops, short walks and nature viewing sites. Day use areas range from primitive sites such as small clearings with no facilities to well developed sites with many facilities which are generally provided in the more developed settings (see Section 30 – *Recreation Use Planning – Visitor Management Settings*).

Site selection and development is influenced by environmental considerations, the role the site plays in providing a range of opportunities for visitors to appreciate the natural and cultural values of the planning area, and the visitor management setting of the area. Future development of day-use facilities will be in keeping with visitor management settings and be compatible with the key values of the planning area.

Many recreational pursuits within the planning area can be carried out in a single day. These include picnicking, barbecuing, sightseeing, swimming, photography, fishing and nature and cultural study. Existing day use facilities enable visitors to enjoy a high quality experience that is comfortable and safe.

Day-use sites are provided in Francois Peron National Park, on South Peron, in Shell Beach Conservation Park and in Edel Land (see Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula* and 43 – *Edel Land*). If demand exceeds capacity during the life of this plan, other sites may be developed for day use.

Existing and proposed day use sites in Francois Peron National Park, on South Peron, in Edel Land and on Dirk Hartog Island National Park are shown in Tables 9, 13, 16 and 20 (see Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*) and on Maps 6, 7 and 8. Five types of day use sites have been described for the planning area: major, medium, minor, beach and wild (remote). Other day use sites may be developed as demand increases and after detailed planning, review of the management setting implications and public consultation.

33.4 - Day Use

Key Points

- A day-use area is any recreation site designed specifically for day visits only and includes picnic and barbecue sites, toilets, lookouts, interpretive stops, short walks and nature viewing sites.
- The Department provides recreation sites specifically for day visitors at a number of sites within the planning area.
- Activities include picnicking, barbecuing, sightseeing, swimming, photography, fishing, walking and nature study.

The objective is to provide opportunities for visitors to stay during the day within the planning area in appropriately designed sites, and that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of day use opportunities consistent with the appropriate visitor management setting and as resources permit (see Table 9, 13, 16 and 20 and Maps 6, 7 and 8);
2. designing and developing day use sites in accordance with Departmental policy and design standards, site capability and environmental impact assessment;
3. encouraging visitors to remove their own litter but providing rubbish bins at selected sites depending on high use or demand;
4. phasing out the use of firewood, except for cultural, community education and interpretation purposes, with the approval of the District Manager and promoting the use of alternatives such as fuel stoves and gas barbeques (see Section 33.3 – *Recreational Activities and Use – Overnight Stays*); and
5. providing gas barbecues at day use sites where necessary.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33.5 – Bushwalking

Walk trails can enhance visitors' experiences of parks and reserves and bushwalking is an activity that is enjoyed by people of varying ages, interests and levels of physical fitness and mobility. Bushwalking can encompass everything from a short, leisurely stroll to a major trek lasting days or even weeks. A range of walk trails of varying distance and duration is required to meet the needs and enhance the experience of visitors.

The impact of bushwalking on the physical environment is generally low compared to other recreation activities, but can vary depending on soil conditions, landform, vegetation type and intensity of use. Where use levels are high, bushwalking has the potential to cause the loss of vegetation, introduce and spread weeds, cause localised soil compaction and erosion, disturb fauna and increase the risk of fire. Sensitive sites within the planning area include coastal dune fields, birridas, exposed bluffs, and heathlands. Usually these problems can be effectively minimised through appropriate design and construction and visitor information.

There are a number of visitor risks associated with walking, especially long distance. These include: dehydration; exposure; becoming lost; being injured and the threat of bushfire. Walks will be adequately sign posted and visitors provided with adequate information to ensure walkers are equipped to handle the conditions they will encounter. In order to minimise visitor risks for long distance walkers, the Department will encourage walkers to register their intentions first and to organise water to be dropped off at various points along trails.

A number of opportunities to explore the planning area by foot will be developed, incorporating a range of experiences, landscapes and lengths of walks. Due to the climatic conditions of the area, lack of surface water and isolation, care will need to be taken in designing and locating walk trails. Pedestrian access will be developed using the following guidelines:

- locating walking tracks to enhance visitor experiences of the range of natural and cultural values of the planning area, provide maximum visual diversity, sustain regular use and, where appropriate, provide access to interpretation opportunities;
- designing and constructing walking tracks to consider the potential environmental impacts such as loss of vegetation, introduction and spread of weeds, localised soil compaction and erosion problems, fauna disturbance and fire risk;
- selecting alignments and grades that are safe and appropriate for visitor requirements with minimum disturbance to the natural environment and minimum requirements for maintenance;
- constructing walking tracks of a consistent class where possible;
- developing walking tracks as circuits or loops where possible and are located to complement or link up with tracks on adjoining lands, where practicable;
- ensuring walks are consistent with the Department's *Disability Access and Inclusion Plan* and, where appropriate, providing walks for disabled visitors;
- providing information to visitors on the degree of track difficulty, length, and a bushwalking code of conduct; and
- matching the class of the track to the appropriate management setting.

Six categories of walking trails are recognised by Standards Australia (2001) with varying modification to the natural environment. These have been adapted by the Department to provide six classifications (see Appendix 8). Under this system, trails range from those with no modification to highly modified trails which aligns with the visitor management settings approach (see Section 30 – *Recreation Use Planning – Visitor Management Settings* and Appendix 7). The most modified trails provided in the 'highly modified' visitor management setting. All categories may be provided for in the planning area.

Walk trails are important to guide people visiting the planning area to features which are sometimes not apparent or are difficult to access by vehicle. Usually walk trails are located in areas of high recreation demand and use and provide a variety of recreation opportunities in areas where it is desirable to manage the impacts on the natural environment by confining visitor use to a single track.

Short walk tracks branching from roadside lay-bys along designated access roads can also provide access to features as well as providing spectacular views over surrounding landscapes and seascapes. Longer day or overnight walking may be undertaken in the planning area along unmarked tracks. Visitors intending to undertake such walks must seek permission from the District office.

Specific detail about walk trails on the Peron Peninsula, in Edel Land, and on Dirk Hartog Island National Park are provided in Sections 40 – *Peron Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*. A summary of the

existing and proposed walks across the planning area and their class is provided in Tables 10, 17 and 21 and Maps 6, 7 and 8. Other bushwalks may be developed as demand increases and after detailed planning, review of the management setting implications and public consultation.

33.5 - Bushwalking

Key Points

- Bushwalking enables visitors to experience the natural environment at close quarters.
- There are a range of bushwalking opportunities across the planning area, within a diversity of landscapes and vegetation types.
- The hot, windy climate, lack of surface freshwater and sandy soils makes long distance bushwalking difficult in the planning area and visitors need to be aware of the safety issues associated with bushwalking in remote areas.
- Although the impact of bushwalking on the environment is generally low, loss of vegetation, the introduction and spread of weeds, localised soil compaction and erosion problems, fauna disturbance and fire risk can occur.

The objective is to provide opportunities for a range of bushwalks within the planning area that are developed to an appropriate class, are safe, facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of bushwalking opportunities consistent with the criteria for each class of track and the appropriate visitor management setting (see Tables 10, 17 and 21);
2. allowing visitors to undertake longer day or overnight walks subject to permission and permit conditions;
3. carefully appraising visitor needs and environmental impacts as well as the availability of resources for the construction and ongoing maintenance of walking tracks;
4. constructing and locating all tracks in accordance with established planning procedures, standards and environmental controls;
5. introducing management controls including the issuing of permits, re-alignment or closure of tracks where walking threatens key values or the enjoyment of other visitors;
6. controlling bushwalking in areas temporarily or permanently closed for reasons including the safety of visitors, the protection of threatened species, rehabilitation or risks associated with fire;
7. providing bushwalkers with a code of conduct that applies to bushwalking within the planning area, including:
   - recommended party size;
   - camping and campfire policy;
   - safety guidelines; and
   - waste disposal.
8. providing adequate information about walking opportunities in the planning area so that visitors can choose walks best suited to their needs and abilities; and
9. liaising with walking groups on development of future walking tracks in the planning area.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33.6 – Recreational Fishing

Fishing occurs across the Shark Bay area in the Marine Park and is discussed in the *Shark Bay Marine Reserves Management Plan* (CALM 1996b). In accordance with the marine reserves management plan, the marine park is zoned into 'general use', 'recreation' and 'special purpose' areas. Implications for the management of the terrestrial estate relate to access for boat launching, coastal fishing and camping. The Department of Fisheries has responsibility for managing fish species (defined under the Fish Resources Management Act) within marine reserves and other waters.

The more popular areas for recreational fishing in Shark Bay include South Passage (Steep Point), Dirk Hartog Island and Peron Peninsula. The greatest fishing effort occurs between April and August when the weather is generally mild and both resident and migratory fish species are present in abundance.

Rock and reef fishers will often take great risks to access favoured fishing sites that are inherently dangerous. Many of the tracks used to access these fishing spots traverse steep cliffs, are eroded and rock features have been broken. There is limited safety information and no safe anchor points provided across the planning area (see Section 35 – *Visitor Safety* and Section 55 – *Information, Education and Interpretation*).

33.6 – Recreational Fishing

Key Points

- Recreational fishing is a popular activity in the planning area and produces many community and economic benefits.
- Beach fishing is one of the most popular recreational activities within the Shark Bay area, placing additional pressure on conservation reserves through the use of four-wheel drive vehicles, boats and uncontrolled pedestrian access to get to fishing sites.
- Fishing activities can disturb sensitive landforms, wildlife, degrade vehicle tracks and generate litter.
- Rock/reef fishing is a high risk activity in the Shark Bay area with some vehicle access and walking tracks used to access rock or reef fishing sites poorly located, posing a threat to users and/or the environment.

The objective is to provide opportunities for fishing within the planning area that are safe, facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts and conflict between users.

This will be achieved by:

1. providing a range of fishing opportunities by varying access conditions including, remote 4WD, 2WD, boat and walk in destinations;
2. providing a range of facilities at fishing destinations including shelters, safe anchor points and signs;
3. ensuring unsafe or inappropriately located fishing access tracks are modified, relocated, or closed and rehabilitated;
4. in consultation with fishers and the Department of Fisheries, implementing appropriate strategies to prevent conflict between fishermen and other users especially at Steep Point and on Dirk Hartog Island National Park;
5. ensuring tour operators conducting fishing tours on terrestrial reserves are appropriately licensed and accredited;
6. ensuring that any walking and vehicle tracks to fishing sites are safely located and do not pose a risk to users or the environment. Inappropriately located tracks will be relocated, or closed and rehabilitated; and
7. providing information to visitors to facilitate sustainable and responsible fishing such as catch care, species conservation, catch and release techniques and appropriate fishing conduct.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33.7 – Recreational Boating

Recreational boating can be motorised (power boats, dinghies and jet skis) or non-motorised (sailing vessels, canoes and sea kayaks). The Department of Transport marine section is responsible for all regulations pertaining to boating including safety, speed, anchoring and moorings. Public boat ramps are provided at Carnarvon, Denham, Monkey Mia and Nanga. Beach launching occurs at many sites across the planning area.

Shark Bay offers many opportunities for sea kayaking in the many sheltered bays and lagoons. The development of specific campsites may be required to facilitate sea kayaking. Guidelines and information for sea kayaking in the planning area will be developed and could include party size, safety, minimal impact camping, wildlife interaction and the identification of sites with restricted access due to important natural values.

Specific details about recreational boating adjacent to Peron Peninsula, Edel Land and Dirk Hartog Island National Park are provided in Sections 40 – *Peron Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

33.7 – Recreational Boating

Key Points

- Recreational boating, both motorised and non-motorised, is a popular activity in the planning area.
- Much of the impact of recreational boating on the terrestrial reserves occurs at the point of access to the water body and associated activities such as camping.
- Recreational boating activities are managed the Department of Transport's marine section.

The objective is to provide opportunities for recreational boating within the planning area that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing visitors with information and facilities to minimise the environmental impact of recreational boating and to promote safety and responsible boating;
2. developing sea kayak trails in the planning area;
3. reviewing license conditions with tour operators to ensure impacts on native fauna, the natural environment and other users is minimised; and
4. liaising with the Department of Transport's marine section to ensure compliance with relevant regulations.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33.8 – Water–based Activities

Although swimming, surfing, snorkelling and diving occur within the marine environment and are addressed in the *Shark Bay Marine Reserves Management Plan* (CALM 1996b), associated facilities such as information and access are located in the adjacent terrestrial conservation reserves and are considered in this plan.

The marine park offers a variety of diving opportunities and marine habitats to explore. In particular, reefs and the shallow and sheltered bays are safe and popular for novice divers and snorkellers. A number of these diving sites are accessible from the shore. Diving and snorkelling activities can help to promote public awareness and understanding of the marine environment. Providing information and interpretation can enhance this experience and highlight safety issues such as the presence of strong currents and potentially dangerous marine animals. There are many sites across Shark Bay that are used for diving and/or snorkelling including places adjacent to Peron Peninsula, Nanga Peninsula, Edel Land and Dirk Hartog Island, especially in the many sheltered lagoons, bays and inlets. Some specific sites across the planning area may be developed and promoted as diving and snorkelling destinations.

Although windsurfing, kite-surfing, waterskiing and scurfing (being towed on a surfboard behind a boat) occur within the marine environment and are addressed in the *Shark Bay Marine Reserves Management Plan* (CALM 1996b), associated facilities such as information signs and access points are located in the adjacent terrestrial conservation reserves and therefore it is appropriate that they are also considered in this plan. These activities have the potential to conflict with and pose a danger to other recreational users. As these activities generally require considerable space for setting up and dismantling equipment, access and egress points should be designated in appropriate areas where there is no conflict with other recreational activities.

33.8 – Water based Activities

Key Points

- The many shallow and sheltered bays of Shark Bay provide opportunities for visitors to experience a range of water-based activities, including snorkelling, diving, windsurfing, kite-surfing, water-skiing and surfing.
- Information and interpretation can enhance the visitor experience and highlight safety issues when undertaking water-based activities.

The objective is to provide opportunities for water based activities within the planning area that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts and conflict with other users.

This will be achieved by:

1. providing information and facilities to promote water-based activities and minimise the impact of

these activities on the native fauna, environment and other users;
2. in consultation with the windsurfing, kite surfing, water-skiing and scurfing fraternity and Marine Parks and Reserves Authority, designating egress and access points to the water so that these activities do not pose a risk to other users; and
3. reviewing license conditions with tour operators to ensure impacts on native fauna, the natural environment and other users is minimised.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

33.9 – Scenic Flights and Other Aircraft

Other than scheduled commercial flights, aircraft activities in the planning area are generally confined to chartered or private flights. Most scenic flight aircraft operate from Denham or Carnarvon and some charter flights operate from Geraldton.

Currently, there are two airstrips on Dirk Hartog Island National Park and one on Nanga Peninsula but these are of low standard and are often closed due to stock movement and effects of rain. The Shire of Shark Bay has proposed constructing an airstrip on the proposed Shire vested reserve at Cape Inscription. Several issues have been identified in considering the construction and maintenance of existing and proposed airstrips in the planning area (see Section 32 – *Visitor Access – Air Access*).

Flight-based sightseeing is recognised as a spectacular way to experience the grandeur of the Shark Bay area. The size of the Shark Bay World Heritage Property makes scenic flights an integral part of the visitor experience. However the use of aircraft on or over natural areas can have impacts on the biophysical environment and on the quality of the experience for other visitors. Conducting commercial tours, taking people to parts of the planning area by air and landing on Department-managed lands will require a commercial licence.

33.9 - Scenic Flights & Other Aircraft

Key Points
- Scenic flights can disturb the recreational experience of other visitors.
- Scenic flights operate from Denham, Carnarvon and Geraldton.
- The location of airstrips across the planning area requires careful assessment using safety, environmental, economic, social and other criteria.

The objective is to manage scenic flights to ensure visitor enjoyment, appreciation and understanding of the key values across the planning area.

This will be achieved by:
1. providing information and facilities to promote scenic flights and minimise the impact of these activities on the native fauna, environment and other users; and
2. ensuring pilots seek approval before landing aircraft, including ultra light aircraft, in the planning area except under permit conditions on designated airstrip, or in emergency circumstances.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

33.10 – Non-Commercial, Education and Not-for-Profit Groups

Non-commercial, educational and not-for-profit groups use the planning area on a regular basis to stay overnight and conduct bushwalking, camping, leadership, outdoor education and personal development programs.

Non-commercial, educational and not-for-profit groups offer experiences to users that would not otherwise be available including access for visitors with special needs delivering interpretation/education messages that foster greater enjoyment, appreciation and understanding of the planning area or assisting with operations on conservation reserves.

The Department requires all organised non-commercial, educational and not-for-profit groups to gain permission from the local District office prior to undertaking their activities. Guidelines and forms have been prepared for groups seeking permission for such activities from the Department.

33.10 - Non-Commercial, Education and Not-for-Profit Groups

Key Points

- Use of the planning area by non-commercial, education and not-for-profit groups is increasing.

The objective is to provide opportunities for non-commercial, education and not-for-profit groups to undertake activities within the planning area.

This will be achieved by:

1. developing a booking system for non-commercial, education and non-profit groups to avoid overuse and conflict with other visitors;
2. designing group camping areas that cater for non-commercial, education and non-profit groups, as well as the general public, as required (see Section 33.3 – *Overnight Stays*);
3. exploring opportunities for non-commercial, education and not-for-profit groups to contribute to management by organising or participating in service projects such as rehabilitation, weed control, rubbish collection or other activities; and
4. investigating partnerships between the Department and non-commercial, educational and not-for-profit groups that provide opportunities for the delivery of education and interpretation programs for people visiting the planning area.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33.11 – Special Events

Requests are often made to undertake 'one-off' special events within the planning area. Generally these involve large groups of people, who require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets. Such events can include car rallies, filming, fund raising, orienteering and rogaining events.

Special events that present opportunities for nature-based recreation may be permitted in parts of the planning area, subject to approval from the Department and other relevant authorities, such as Department of Health. These events must be consistent with the Department's Policy Statement No. 18 – *Recreation, tourism and visitor services* (DEC 2006b) and will be assessed on a case-by-case basis against a number of environmental and social criteria. Where requests are made to conduct special events for activities that are inconsistent with these policies, the event must be of national significance and approval is required from the Conservation Commission. Where possible, events should use existing roads and tracks.

Before special events are approved, the availability of suitable areas outside the planning area will be considered and limits or restrictions may be placed on events to assist in meeting the above criteria. Where an event is approved, proponents will be required to adhere to specific conditions where appropriate. Competitive car rallies and other motor sports are not desirable in national and conservation parks and will not be permitted.

33.11 - Special Events

Key Points

- Special events are assessed on a case-by-case basis and are permitted subject to approval from the Department, other relevant authorities and where necessary, the Conservation Commission.

The objective is to provide opportunities for organised special events that allow participants to experience the planning area in suitable locations whilst minimising the environmental impact and conflict with other visitors.

This will be achieved by:

1. assessing special events on a case-by-case basis and permitting them where the activity is consistent

with the Policy Statement No. 18 – *Recreation, tourism and visitor services* (DEC 2006b);
2. approving the event subject to Departmental conditions and, in some cases the endorsement of the Conservation Commission; and
3. ensuring that special events are held only within appropriate visitor management settings and pose minimal adverse impact on the environment or risk to other visitors.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

34. TOURISM AND COMMERCIAL OPERATIONS

With the growing popularity of nature-based tourism, opportunities exist for partnerships between the Department and private sector tourism operators. The Department has a complementary role with the tourism industry in managing and presenting natural assets.

Tourism is one of the world's fastest growing industries and nature-based tourism is its fastest growing segment (WATA and CALM 1997). Research shows that today's travellers are more environmentally conscious, and are seeking new experiences and more information about the destinations that they visit. The growing demand for nature-based tourism will increase pressure on the natural environment. The long-term viability of the nature-based tourism industry is dependent on maintaining the integrity of the natural environment and increased environmental awareness of visitors. Given the growth in nature-based tourism throughout the region, it is likely that demand for facilities in or near the planning area will increase. Future commercial developments may be considered in appropriate visitor management settings.

A commercial concession is a right granted, in consultation with the Conservation Commission and the Marine Parks and Reserves Authority, by way of a lease or licence for occupation or access and use (respectively) of an area of land or water managed by the Department. Commercial concessions can meet the rising demand for high quality recreation and tourism opportunities, facilities and services, promote environmental awareness and generate income to help meet the costs of managing the natural resource. Commercial concessions must be consistent with the purpose of the park, the protection of its key values and with the objectives of this plan.

Private tourism developments exist and others are likely to be proposed for the planning area. It is important that, such tourism developments do not adversely impact on World Heritage and other key values and this is monitored through the approvals process. Existing tourism facilities in the Shark Bay area include hotel and caravan park accommodation with associated facilities and services at Denham, Monkey Mia and Nanga. A small caravan park is located at the Hamelin Pool Telegraph Station. Dirk Hartog Island currently provides tourist accommodation and services at the homestead. The proposed ecotourism development on Dirk Hartog Island within the freehold lots at Sunday Island Bay and adjacent to the homestead lot is likely to result in an increased level of commercial tourism on the island. Commercial tourism accommodation has been proposed on freehold land at Nanga. All the existing and proposed developments have implications for the whole Shark Bay area.

Leases

Leases, which allow a lessee to occupy a particular area of land, are granted under section 100 of the CALM Act. A lease provides security to protect significant investments and may be up to 21 years with an option of a further lease up to 21 years. The length of a lease is usually proportional to the level of investment and the return on that investment. At present there are no tourism leases issued within the planning area. However there are a number of possible opportunities (such as varying types of overnight accommodation) not provided elsewhere in the Shark Bay area (see Section 33.3 – *Recreation Activities and Use – Overnight Stays*).

The provision of low-impact, nature-based-accommodation encourages visitors to interact with and understand the natural, cultural and historical features of an area. Tourism Western Australia's Landbank project was created to ensure an adequate supply of low-impact tourism development sites meet the future needs of the tourism industry in Western Australia. Landbank works by identifying potential tourism accommodation sites and then undertaking the planning and approvals procedures that will make the sites investor ready. Planning and preparation for Landbank sites can include initiatives like a flora and fauna survey, a heritage assessment, Native Title clearance or a groundwater study.

Part of the Landbank project includes the search for suitable tourist accommodation sites within lands managed by the Department and is being called Naturebank. The intention is to improve the range of experiences

available for visitors and to generate tourism contribution to the biodiversity of our national parks and other conservation lands within Western Australia. Naturebank has the capacity to provide for different types of tourist accommodation appropriate to the area and in proximity to some of Western Australia's most iconic places and landmarks.

The Department is able to apply conditions not only on the operation of the accommodation facilities but also the range of commercial activities that are linked to the facility. This provides the capacity to guide activities in a way that ensure they are consistent with wider environmental and cultural attributes, and in accordance with planning and on-going management of the conservation estate.

A number of areas within the management area have the capacity to support accommodation and the Naturebank project has already considered sites within the Francois Peron National Park. To date no site has been chosen for more intensive consideration and any potential tourism project would be preceded with considerable assessment of the range of values in the area. In addition, other potential low-impact nature-based accommodation sites exist within the planning area (see Section 33.3 – *Recreation Activities and Use – Overnight Stays*). The number of sites to be developed has not yet been determined. Tourism projects will be fully integrated into wider park management.

For all tourism developments, a process of assessing potential sites and development opportunities is undertaken prior to the advertisement of an Expressions of Interest. Sites on Department-managed land are assessed against a range of sustainability indicators including:

- the protection of the natural environment (e.g. maintenance of natural ecology, erosion, extent of soil loss, compaction and vegetation damage, volume of water used, amount of solid waste produced on site, amount of non-renewable energy consumed on site, vehicle use for visitor trips, light spill and noise levels);
- the built environment (e.g. site design and layout, style and character, design form and function, waste water volume, quality and disposal methods, methods of energy production, fuel and chemical storage, handling and chemical spill procedures, toilet facility standards and operation and waste storage and disposal methods);
- the social environment (e.g. level of Indigenous ownership and employment, culturally sensitive behaviour, provision of interpretive materials, safety equipment and procedures, visitor feedback, content of marketing material, expenditure from local businesses and membership of local associations); and
- the business environment (e.g. market demand study, cash flows and profit and loss forecasts, financial capacity, details of commercial activities to be conducted and relevant tourism accreditation).

KPIs are also being added to leasing conditions as a way of assessing the performance of lease holders. Any new lease will have KPIs.

Other leases may be developed for other facilities such as communications towers and airstrips (see Section 53 – *Public Utilities and Services*).

Specific information about leases on Peron Peninsula and Nanga Peninsula and Edel Land is provided in Sections 40 – *Peron Peninsula*, 41 – *Nanga Peninsula*, 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

Licences

Licences allow operators to access and use lands and waters managed by the Department. Activities carried out under a licence are generally itinerant and do not require substantial infrastructure. All private tour operators conducting commercial tourist activities on conservation reserves are required to obtain a licence in accordance with section 101 of the CALM Act and Part II of the CALM Regulations 2002. Licensing enables the Department to monitor and regulate access and use of lands and waters managed by it to ensure natural and other values are maintained. By protecting these values, tour operators will be able to continue to visit areas maintained to the satisfaction of visitors. As at August 2007, 145 licensed operators are listed as using the lands and waters of the planning area.

Opportunities exist to continue to develop appropriate commercial tourism operations. Concessions for activities and services such as vehicle-based tours, canoeing, boat hire, water-based activities, guided walks, overnight accommodation, wildlife interaction and nature study tours could greatly increase visitor interest in, and attract more visitors to, the planning area. An assessment of these activities based on protecting the key values of the planning area will be carried out prior to issuing of any commercial concession.

The participation of local Indigenous people in promoting aspects of culture and lifestyle is of interest to visitors and offers commercial enterprise opportunities. The interpretation of the planning area from the perspective of Indigenous people must take place in a manner supported by local Aboriginal people.

Conditions apply to all licences to minimise the impacts of activities, or to aid in management of the value being appreciated by the public. Managers consider the following factors before issuing licences:

- infrastructure requirements of tour operations (e.g. adequate toilet facilities, access and parking for large vehicles);
- benefits in education and appreciation of natural, recreation and cultural values;
- negative impacts on wildlife;
- potential impacts to water quality;
- waste management;
- potential soil disturbance;
- potential damage to or loss of vegetation;
- potential damage to sensitive landforms and other sensitive areas;
- visitor safety;
- competence of group leaders;
- potential conflict with other users; and
- the appropriateness of retail concessions in particular natural environments.

Guidance for the general conditions for tour operators in national parks and conservation parks is provided for in the Department's *Tour Operator Handbook – Terrestrial* (DEC 2008b).

The Department issues two types of licences, depending on the nature of the activity, the security of the resource, and the risk to the participants. 'T' Class licences are issued when the activity is open to many operators. In these circumstances, environmental and visitor management objectives can be achieved simply through appropriate licence conditions. The majority of tour operators fall into this category and examples include safari tours and guided walks. The term of the licence depends on the level of accepted tourism accreditation achieved by the operator. The Department can grant a licence for up to five years and renew it for the same period. Currently the Department issues one, three and five-year licences as follows:

- a one-year licence is issued to an operator who is not accredited with any program;
- a three-year licence is issued to an operator who is accredited with one tourism program. The operator can be accredited with a business accreditation program such as the National Tourism Accreditation Program or an ecotourism activity/product accreditation program such as the Eco Certification Program (formerly known as Nature and Ecotourism Accreditation Program);
- a five-year licence is issued to an operator who is accredited with two tourism programs such as a business accreditation program and an ecotourism activity/product accreditation program; and
- a two-month licence is issued and no accreditation required to meet the needs of seasonal or interstate operators.

'E' Class licences are issued where there are safety, environmental or management concerns that require the number of licences to be restricted, for example, boat tours in confined areas. Generally 'E' Class licences are issued following a formal 'Expression of Interest' process. There are currently no operators with 'E' Class licences operating in the terrestrial reserves. 'E' Class licenses have been issued for marine wildlife encounters in the Shark Bay area.

Fees are associated with all commercial tourist activities conducted on lands or waters managed by the Department. Companies conduct tours in the Monkey Mia Reserve, Francois Peron National Park, Shell Beach Conservation Park and Nanga Peninsula. Tour operators using parts of South Peron, parts of Edel Land, Dirk Hartog Island National Park or other proposed reserve additions will require a licence to operate.

Camel and horse riding is only permitted in national parks and conservation parks where the impacts can be managed. Potential impacts include the introduction of weeds, spread of disease, damage to flora, disturbance of fauna, soil disturbance and conflict with other users. Specific details about commercial horse-riding on Peron Peninsula is provided in Section 40 – *Peron Peninsula*.

Commercial tourism activities will be monitored to determine their environmental impacts. Operating conditions will be regularly reviewed and modified to address specific problems. If necessary, licences can be

cancelled. Close liaison and training should be facilitated to improve the understanding by commercial operators of the area's key values and address management issues.

34 - Tourism and Commercial Operations

Key Points

- Tourism concessions can increase the range of services and recreational experiences within parks and reserves.
- A commercial concession is a right granted by way of a lease, licence or permit for occupation or use under appropriate conditions, of an area of land or water managed by the Department. Accreditation with a tourism program will enable a long-term licence to be issued.
- Opportunities for tour operators include vehicle-based tours, air based tours, wildlife interaction, water based activities, guided walks, provision and/or management of accommodation, camping, nature study and cultural tours.

The objective is to ensure that commercial tourism activities are compatible with other park and reserve management objectives and to extend the range of services and recreational experiences available in the planning area through the involvement of private enterprise.

This will be achieved by:

1. ensuring all commercial operations operate under a lease, licence or permit agreement with appropriate conditions that:
   - are consistent with other management objectives within the planning area;
   - facilitate park and reserve management;
   - provide a service or facility to visitors that the Department would not otherwise be able to provide; and
   - reviewed as appropriate.
2. encouraging tour operators to acquire quality assurance through industry accreditation and qualification programs;
3. evaluating proposals for licences and commercial tourism leases according to Departmental policy and permitting their establishment where appropriate;
4. identifying sustainable levels of operator use and monitoring the impact of these activities; and
5. investigating establishment of nature-based accommodation of varying styles and standards in appropriate locations.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

35. VISITOR SAFETY

The Department often manages areas that are remote from emergency services, hard to access by emergency vehicles and not within mobile phone network coverage. The Department works closely with the State Emergency Service, the Western Australian Police Service, St John Ambulance and volunteer fire brigades in responding to incidents within the parks and reserves. The Department manages risks to visitors' safety by implementing a visitor risk management program (Policy Statement No. 53 – *Visitor Risk Management*, CALM 1997), which includes:

- carrying out periodic safety audits of all recreation sites, facilities and visitor services to identify and assess risks and potential hazards and using this information as part of the basis for preparing and implementing recreation site and facility maintenance programs;
- developing and maintaining a database to monitor the hazard condition of sites and facilities and the frequency, situation and type of injury and misadventure incidents that occur in the parks and reserves; and
- promptly investigating all reported visitor accidents and injuries on Department-managed lands and waters and implementing appropriate risk mitigation measures.

In addition to a genuine concern for visitor welfare, the Department has a legal responsibility to consider the personal safety and welfare of visitors to the public conservation estate. The Department aims to minimise the potential for injuries and misadventure to visitors, in a manner that does not render the environment sterile or unnecessarily diminish visitor use and enjoyment in the process.

The most common risks to visitor safety in the planning area include slipping and tripping on uneven ground, damaged recreation structures, being swept from rocks by waves, vehicle accidents and dehydration.

Many visitors to the planning area deliberately seek out activities that involve risk. Opportunities for risk taking are essential to many people's attraction to the outdoors and visitors are expected to take responsibility for their own safety. The Department seeks to encourage appropriate visitor behaviour whilst undertaking recreational activities that involve risk. High risk activities in the planning area include rock fishing and travelling in remote areas (see Section 33 – *Recreation Activities and Use*).

A visitor risk management program for the reserves will be established and regularly updated. This program will evaluate the risks to visitors, assign priorities for risk management within available resources and establish action plans for risk control.

Specific details about visitor risks in Edel Land and on Dirk Hartog Island National Park are provided in Sections 43 – *Edel Land* and 44 – *Dirk Hartog Island*.

35 - Visitor Safety

Key Points

- The Department manages the risks presented to visitors by implementation of Policy Statement No. 53 – *Visitor risk management* (CALM 1997) and the visitor risk program.
- The Department has a moral and legal responsibility to minimise visitor risk.
- As part of the visitor risk management program, designated recreation sites are routinely audited to identify visitor risks.
- Some of the proposed conservation reserve additions have been formerly assessed for visitor risk and the limestone cliffs along the west coast of Edel Land and Dirk Hartog Island National Park are potentially high risk areas.
- The coordination of search, rescue or recovery operations is the responsibility of the Western Australian Police Service, although the Department often organises an initial response on the lands and waters it manages and provides advice and assistance if requested.
- The most common risks to visitor safety in the planning area include slipping and tripping on uneven ground, damaged recreation structures, being swept from rocks by waves, vehicle accidents and dehydration.

The objective is to minimise risks to the public who visit the planning area while maintaining a range of visitor experiences.

This will be achieved by:

1. continuing to undertake formal risk assessment of all existing recreation sites and facilities as part of the visitor risk management program;
2. implementing a formal risk assessment of all recreation sites within the proposed conservation reserve additions and incorporating future monitoring into the District's regular visitor risk assessment program;
3. providing staff with appropriate training to undertake risk assessments;
4. continuing to provide information including visitor risk and interpretive signs to highlight potential hazards and risk avoidance at all regularly visited recreation sites;
5. adopting codes of safe conduct for popular activities (such as four-wheel driving, hiking, swimming, fishing, sea kayaking and surfing) and promoting and publicising them as appropriate;
6. developing emergency evacuation plans in the event of bushfires and cyclones; and
7. investigating methods of improved emergency communication within the planning area.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
35.1 Percentage of accidents/incidents and visitor injuries per visit reported to the Department.	35.1 Reduction in the percentage of accidents/incidents and visitor injuries per visit reported to the Department.	Annually

36. DOMESTIC ANIMALS

Domestic animals such as dogs, cats, horses and birds are important companions for many people and are often considered part of the family. Local people may frequently take dogs on day trips and overnight stays to parts of the planning area. Landholders adjacent to the planning area also use their dogs in pastoral operations.

Domestic animals are not permitted in nature reserves. They are not usually permitted in national parks or conservation parks although, under the *Conservation and Land Management Regulations 2002*, they are allowed in 'designated areas'. The exception is guide and hearing dogs for visually and hearing impaired visitors and specially trained dogs for search and rescue operations.

Within the current and proposed reserves, domestic animals are considered undesirable. It is important domestic animals, and especially dogs, are not taken into parks and reserves because:

- domestic animals can increase the spread of weed species and also increase vegetation disturbance;
- domestic dogs and cats can predate on and disturb native fauna;
- the lasting scent left by dogs can scare some native fauna away, which in turn can also affect the opportunity for visitors to interact with wildlife;
- dog faeces carry diseases which can be harmful to wildlife and people;
- dogs can interfere with the enjoyment of other planning area visitors; and
- fox baits regularly used in parks and reserves are poisonous to dogs (see Section 24 – *Introduced and Other Problem Animals*).

In the planning area dogs will be permitted in designated areas of the proposed South Peron (yet to be named) Conservation Park. This area is baited with 1080 baits for fox control and appropriate signs warning of the risks will be provided. They will not be permitted on Francois Peron National Park, Dirk Hartog Island National Park, Edel Land, Nanga Peninsula or the Zuytdorp area except in special circumstances. Other opportunities for people to take their pets onto lands may also exist on recreation reserves vested in local Shire of Shark Bay.

36 - Domestic Animals

Key Points

- Domestic animals are not permitted in nature reserves and only permitted in national parks and conservation parks in 'designated areas'.
- Domestic animals can predate on and disturb native animals, carry disease and interfere with the enjoyment of other visitors.
- Exemptions may be granted for guide dogs, hearing dogs and dogs for search and rescue, which may be allowed throughout the planning area.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:

1. not permitting domestic animals in Bernier and Dorre islands, Francois Peron National Park, Dirk Hartog Island National Park and proposed Edel Land National Park, with the exception of guide dogs and dogs associated with search and rescue operations (see Section 24 – *Introduced and Other Problem Animals*);
2. only permitting domestic animals in designated areas of Shell Beach Conservation Park and proposed South Peron (to be named) Conservation Park (see Section 24 – *Introduced and Other Problem Animals*); and
3. providing information explaining Departmental policy on domestic animals and enforcing it as necessary.

Key Performance Indicators:
There is no Key Performance Indicators for this section.

37. VISUAL LANDSCAPE

Shark Bay meets all four natural criteria for World Heritage. A place must be of outstanding universal value to be placed on the World Heritage List. The current relevant (landscape) criterion for a place to be included on the World Heritage List as natural heritage is that it: "contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance".

Visual landscape management is based on the premise that the visual quality of any landscape is a resource in its own right and can be assessed and managed in much the same way as other resource values, such as fauna, flora, water and recreation. The role of landscape management is to ensure that all uses and activities are planned and implemented to complement rather than detract from the inherent visual quality of the environments in which they occur.

In the context of this section, the term 'landscape' refers to the appearance or visual quality of an area. For many, visual appearance is the most direct way visitors will experience an area and therefore, is often the criterion by which land management practices are judged.

A landscape study of the World Heritage Property was completed in 2001 (CALM 2001). This study comprised two components, one which assessed landscape values and the other dealing with the management of those values. The assessment consisted of:

- an inventory of relevant data;
- the identification and description of landscape character;
- community perception and values;
- significant features;
- community use of the area;
- sensory characteristics; and
- landscape classes.

Management of the values were dealt with by outlining:

- the management context;
- landscape planning;
- planning community use and recreation;
- management recommendations; and
- evaluation of proposals.

Landscape Character Types & Scenic Quality

Every landscape has an identifiable visual character determined by its context of geomorphology, hydrology, soils, vegetation, land use and cultural heritage values. According to these features, landscapes in Western Australia have been broadly identified and described as Landscape Character Types in order to assess their visual landscape values (CALM 1994b).

The Landscape Character Types that cover the planning area include the Shark Bay Peninsulas (central part of the planning area) and the northern part of the Kalbarri Sandplain (southern and western part of the planning area). The Shark Bay Peninsulas has two sub-types, 'Edel' and 'Peron'. Only the 'Kalbarri Sandplain Type (northern part)' occurs across the planning area. The eastern edge of the planning area joins the Carnarvon Coastal Plain Landscape Character Type.

Within each Landscape Character Type, the scenic quality has been classed as high, moderate or low. This is typically based on diversity, uniqueness, prominence and naturalness of landform, vegetation and waterform within each type (CALM 1994b). Areas of high scenic quality are listed in Table 6.

Table 6: Areas of High Scenic Quality within the Planning Area

Landform	Vegetation	Waterform
Shark Bay Peninsulas Type, Edel Sub-type		
❖ Steep cliffs and dissected slopes e.g. Zuytdorp Cliffs ❖ Diverse coastline edges with platforms, beaches and headlands, e.g. Steep Point. ❖ Primary dunes which display areas of active weathering, e.g. blowouts on Dirk Hartog Island. ❖ Islands, sandbars and tidal flats, e.g. Egg Island ❖ Ridges and dune formations of distinctive height configuration or combinations which provide obvious contrast to landform patterns common in surrounding area, e.g. Herald Heights	❖ Distinctive areas of native vegetation which create unusual forms, lines, colours or textures in comparison to the surrounding landscape e.g. samphire in salt pans. ❖ Windshaped or dwarfed vegetation, e.g. cliff top heath. ❖ Striking displays of seasonal colour, e.g. blooming wattles. ❖ Strongly defined patterns of vegetation due to botanical zone transition, e.g. tree heath and arid species	❖ All salt pans or birridas, filled and dry. ❖ Unusual shoreline motion due to rocks, islands or platforms ❖ Intermittent watercourses, saline mudflats or inundated tidal zones that become focal points due to contrast with associated terrestrial and vegetation features, e.g. Mangrove Bay.
Shark Bay Peninsulas Type, Peron Sub-type		
❖ Diverse coastline edges with platforms, beaches and headlands, e.g. Cape Peron North. ❖ Landforms of unique, distinctive or contrasting colours or forms, e.g. Shell Beach. ❖ Dune formations of distinctive height or shape which are visually prominent in the surrounding landscape. ❖ Islands, sandbars and tidal flats, e.g. Pelican Island.	❖ Strongly defined patterns of vegetation due to botanical zone transition, e.g. tree heath and arid species. ❖ Distinctive areas of vegetation patterns which result from form, line, colour or textural combination which contrasts with the surrounding vegetation and landscape, e.g. vegetation surrounding birridas.	❖ All salt pans or birridas, filled or dry. ❖ Areas exhibiting a mosaic of shades due to shallow sandbars, intertidal flats or seagrass banks.
Kalbarri Sandplain Type (northern part)		
❖ Irregular coastline edges with platforms, rocky islands, rock stacks, natural arches and other erosional features of unusual configuration, e.g. Natural bridge. ❖ Steep cliffs and heavily dissected steep slopes, e.g. Zuytdorp Cliffs. ❖ Hills, ridges, peaks and dunal formations of distinctive form which become focal points, e.g. Womerangee Hill.	❖ Windshaped or dwarfed vegetation unusual in form, colour or texture, e.g. clifftop vegetation. ❖ Areas of high plant diversity which displays distinctive textural and colour patterns, e.g. Sandplains heath. ❖ Single plants or groups of plants which become focal points due to shape, colour, isolation or position in landscape, e.g. white plume grevillea. ❖ Dramatic displays of seasonal colour.	❖ Unusual ocean shoreline motion due to islands, platforms, reefs and other landform configurations, e.g. Oyster Reef. ❖ Winter wet depressions, soaks and clay pans.

(based on CALM 1994b)

Visual Landscape Management

Visual landscape management involves maintaining, restoring or enhancing natural and cultural landscape values, as well as planning and designing land use activities and developments to provide diverse views and minimise negative impacts. Human imposed changes to the landscape should be subordinate to the established natural visual character.

Key factors to consider in visual landscape management include:

- visual changes to the landscape occur continually—natural changes are generally subtle, harmonious and occur very slowly (although there are exceptions, for example, events such as fire, storms and cyclones) whereas, human-imposed changes can visually dominate natural elements, appear discordant, alien and can occur abruptly if not done well; and
- the ability of the landscape to absorb change without the loss of scenic value depends on factors such as slope, soils, vegetation cover and scope of change.

Guidelines for Management

The Department's Policy 34 – *Visual Resource Management of Lands and Waters Managed by CAL*M (CALM 1989) provides broad guidelines for landscape management, particularly the planning and implementation of new facilities, buildings, recreation sites, signs and infrastructure. This is further supported by the *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design* (WA Planning Commission and DPI 2008).

The relatively unspoilt nature of the planning area's landforms and low-lying vegetation contributes to a visual landscape that is highly sensitive to changes. For example, minor tracks, telecommunication towers, fishing shacks and gravel pits may be highly visible when viewed from high points, the air or the sea. It is important to take advantage of all opportunities to minimise the visual impact of development, for example by positioning sites in low-lying areas or dune swales. It is also important to ensure that visual impacts are considered from both land and sea perspectives.

Areas of high scenic quality are the areas requiring greatest emphasis in terms of visual landscape management and are the most sensitive to alterations. Any changes should borrow from the natural established landscape character and be unnoticeable to the casual observer. Changes to areas of moderate scenic quality should borrow significantly from natural elements but may be apparent to the observer. Areas of low scenic quality are of least visual concern and sensitivity to alterations. Changes should consider natural elements but may be dominant to the observer.

37 - Visual Landscape

Key Points

- The Shark Bay area has been characterised as Shark Bay Peninsulas Landscape Character Type, with two sub-types Edel and Peron, and Kalbarri Sandplain Landscape Character Type (northern part).
- Policy Statement No. 34 – *Visual Resource Management of Lands and Waters Managed by CALM* provides broad guidelines for visual landscape management.

The objective is to protect and enhance the planning area's visual landscape qualities.

This will be achieved by:

1. assessing any proposed management activities and development of park and reserve facilities to determine their impact on landscape/seascape values;
2. planning fire management programs to minimise negative impacts;
3. liaising with neighbouring land managers and local government to ensure that the Department's visual landscape management guidelines are considered in any development proposal, and providing advice upon request; and
4. following the general landscape management guidelines set out in Policy Statement No. 34, Appendix 9.

Key Performance Indicator (see also Appendix 1)

Performance Measure	Target	Reporting Requirements
37.1 Changes to areas of high scenic quality.	37.1 No significant loss of areas of high scenic quality over the life of the plan.	Every five years

38. BERNIER, DORRE AND KOKS ISLANDS

Following analysis to define the type and level of recreation that can be sustained on Bernier, Dorre and Koks Islands, a visitor management setting of 'Natural' has been applied. In areas with a 'Natural' setting, the conservation of significant natural and/or cultural values is a priority, with low level recreation (see Map 5).

The vision for Bernier, Dorre and Koks Islands is to protect the unique natural and significant cultural values. Therefore, consistent with the recommendations from the *Shark Bay Terrestrial Reserves Management Plan* (2000), only low-key recreational day use will be provided and camping will continue to be prohibited, except for research and management projects.

The number of visitors who currently use the islands is fairly low and they are predominantly from Carnarvon. The most visited places are Hospital Bay and Red Cliff Point on Bernier Island, and Disaster Cove and White Beach on Dorre Island because of the safe anchorages at these areas. On occasion, research scientists from the Department and other organisations use the islands at night with an appropriate research permit. No recreation and tourism developments will be provided on the islands. Information will be provided to educate the public about appropriate use and natural and cultural values of the islands and their surrounding waters including the most visited sites and boat ramps from nearby towns. In addition programs for community consultation, information and education will be provided, particularly for school groups, and visitor registration, surveillance and enforcement will be implemented as required and resources allow.

38.1 Access

Special Access

Prohibited areas are those that may not be entered except as authorised by the Chief Executive Officer of the Department, and then only to carry out activities pursuant to the plan. Limited access areas are those that restrict activities that may be undertaken.

In 1970, Bernier Island was gazetted a "limited access area" for day use only and Dorre Island was gazetted a "prohibited area" closed to all persons without specific approval. The intent of these access restrictions was to protect the islands' natural values and allow scientists to measure any disturbance caused by human use against an untouched area. Due to the remoteness of the islands, these restrictions have never been fully enforced and visitors have camped on both islands for many years. The *Shark Bay Terrestrial Reserves Management Plan* (2000) recommended that access to Dorre Island be changed to "limited access area" to be consistent with Bernier Island.

Both Bernier and Dorre Islands are of extremely high importance for the conservation of the western barred bandicoot, banded hare wallaby, the Shark Bay rufous hare wallaby sub species, the boodie and the Shark Bay mouse, which are only found naturally on one or both of these two islands. Therefore these values should not be compromised and access restrictions are required.

For much of the time, Bernier and Dorre Islands are windswept and difficult to access and land on due to often rough seas but during fine weather, the islands can be reached relatively easily and are visited by local people for recreation. The risk from visitors to the islands' natural values and particularly the threatened mammals that occur there is too high for unrestricted access. Therefore this plan proposes that the current access restrictions remain unchanged. These restricted access provisions should not prevent use of the islands in emergencies where human safety is at risk, such as in the advent of an accident or unexpected bad weather.

The continued application of a prohibited access area for Dorre Island is required because:

- the potential for a highly contagious wart-like/carcinoma disease found in resident Western barred bandicoots on Bernier Island to be carried on visitor footwear and infecting the clean Dorre Island populations;
- the high susceptibility of the islands vegetation to bushfire due to dry conditions with the most likely ignition sources being from human activity; and
- the potential for increased risk of introduction of pets or weeds by visitors (Bernier Island has infestations of buffel grass while Dorre Island is free from this species and its introduction has the potential to decimate the spinifex hummock grasslands).

Some landforms on the island are vulnerable to damage from pedestrian traffic, particularly the soft, steep coastal cliffs adjacent to the main visitor sites. Minor erosion from pedestrian use is evident at Disaster Cove, although there has been no thorough assessment of the impacts of visitation. Habitat degradation has occurred in some areas as a result of camping. A visitor survey in 1993 showed that most visitors camping ashore have a campfire and a third of these fires are fuelled by wood collected on the islands. If camping was allowed, the risk of bushfire would increase and the impact of bushfire on natural values would be severe. Controlling access will limit the number of people and minimise the damage being caused to these fragile areas.

A significant threat to the islands' natural values is from visitors bringing animals ashore, particularly introduced predators such as cats, foxes or rats. The introduced predators can have a severe impact on threatened fauna populations. Vessels other than dinghies should not be beached to minimise the risk of pests such as mice or cockroaches being introduced. Another risk from visitation to the islands is to the beach nesting animals such as seabirds and turtles that may be disturbed by visitor activities.

To ensure that recreational use has minimal impact on the Reserve's natural values, the Department will continue to implement programs for community consultation, information, education, visitor registration, surveillance and enforcement.

Regular, approved research expeditions are made to the Islands. Researchers may camp on the Islands for periods of up to two weeks, with most conducting research on threatened nocturnal mammals. During the preparation of the previous plan, there was consideration of whether researchers should continue to be allowed to camp on the islands. The community advisory committee formed for the previous management plan determined that researchers should continue to be able to camp on the islands due to the impracticalities and cost of being based on a boat which would preclude much of the research work being undertaken. However the intent should always be to minimise camping on the island and camping on a boat should be undertaken whenever possible.

38.1 – Bernier, Dorre and Koks Islands - Access

Key Points

- Currently Bernier Island is a 'limited access area' for day use only and Dorre Island is a 'prohibited area' closed to all persons without specific approval.
- The 'prohibited area' gazettal of Dorre Island has been difficult to enforce.

The objective is to limit access to Bernier, Dorre and Koks Islands so there are no adverse impacts on the key values of the planning area or visitor appreciation of these values and minimal conflict with other users.

This will be achieved by:

1. retaining classification of Dorre Island as a 'prohibited access area' and Bernier Island as a 'limited access area' under section 62 of the CALM Act ; and
2. continuing to work with the Carnarvon community in managing Bernier and Dorre Island as restricted access areas.

39. SHARK BAY ISLANDS

Following analysis to define the type and level of recreation that can be sustained on the Shark Bay Islands, a visitor management setting of 'Natural' has been applied. In areas with a 'Natural' setting, the conservation of significant natural and cultural values is a priority, with low level recreation, although on the larger islands there may be some areas with evidence of existing human activity (see Map 5). This management plan proposes to gazette restricted access conditions for the island nature reserves. No camping will be permitted on the islands.

The vision for the Shark Bay Islands is to protect the natural values.

The number of visitors who currently use the islands is fairly low and not likely to increase. The most visited islands are Salutation, Baudin and Three Bays Islands as they are relatively large and have safe anchorages. Most of the other islands are difficult to land on and therefore are not attractive for recreation. No recreation and tourism developments will be provided on the islands and no camping will be permitted on any of these islands. Information will be provided to educate the public about appropriate use of the islands and their surrounding waters.

39.1 Access

Special Access

The presence of humans on the many smaller islands, islets and rocks has significant potential to disturb the islands' native fauna, degrade landforms, trample vegetation and introduce or spread weeds. Visitation is evident on several islands, particularly Salutation, Baudin and Three Bays Islands. These three islands are relatively large and have safe anchorages, diverse scenic values and sandy beaches for landing and recreation. Salutation Island contains the reintroduced threatened greater stick nest rat and Baudin Island is home to the endemic Baudin Island spiny tailed skink. Visitors are not allowed to make campfires or bring animals ashore and there are no defined paths on these islands. Seasonal or permanent restrictions on access to some islands may need to be introduced where bird breeding or roosting colonies are particularly sensitive to disturbance.

This plan proposes that Salutation Island be gazetted under section 62 of the CALM Act as "limited access area" for day use recreation only and that overnight use be prohibited because of the presence of stick-nest rats. The other larger islands will be monitored and if necessary have limited access area gazetted. Monitoring of visitor use and impacts will continue, and if the natural values of particular islands cannot sustain the effects of visitation, further access restrictions will be introduced.

39.1 – Shark Bay Islands - Access

Key Points

- The Shark Bay Islands have important natural values, including habitat for breeding seabirds.

The objective is to limit access to the Shark Bay Islands so there are no adverse impacts on the key values of the planning area or visitor appreciation of these values and minimal conflict with other users.

This will be achieved by:

1. classifying Salutation Island as a "limited access area" under section 62 of the CALM Act to allow for day use but no overnight recreational use and considering the classification of Baudin Island, Three Bays Island and other smaller islands as a "limited access area" under section 62 of the CALM Act if required.

40. PERON PENINSULA

Following analysis to define the type and level of recreation that can be sustained on Peron Peninsula, a number of visitor management settings have been proposed for the Peninsula including 'Highly Modified', 'Recreation', 'Natural-Recreation' and 'Natural' (see Map 5). Therefore, in areas with a 'Natural' setting, the conservation of significant natural and cultural values is a priority, with low level recreation. In areas with a 'Natural-Recreation' setting, the conservation of significant natural and cultural values is a priority, with low to medium level recreation. In areas with a 'Recreation' setting, there is the provision for moderate intensity recreation in a mostly natural landscape. In areas with a 'Highly Modified' setting, there are high-level recreation, education and interpretation and group activities specifically catered for at many sites.

The vision for Peron Peninsula is to provide two-wheel and four-wheel drive destinations that offer a range of nature-based recreation and tourism opportunities and experiences in a natural environment that is managed for ecological restoration.

The vast areas of shrubland and extensive stretches of coastline provide a range of opportunities for recreation use and activities including nature appreciation, camping, picnicking, fishing, water-based activities such as sea kayaking and swimming, bushwalking and four-wheel driving along remote coastlines and to a lesser extent two-wheel driving along sealed or unsealed roads. Some coastal recreation sites are of a poor standard with evident signs of landscape degradation and loss of amenity. Some sites, notably coastal cliffs and birridas, present safety risks to visitors. Natural features of special attraction to visitors are largely coastal - lagoons, beaches, cliffs, mangroves, dunes, headlands and pristine coastlines.

Visitor numbers to the different parts of the Peron Peninsula vary considerably. Peron Peninsula will remain the primary focus of visitor and resident interest in Shark Bay due to: sealed access to Denham and Monkey Mia and

proximity to attractions; the proximity of Francois Peron National Park and proposed South Peron (to be named) Conservation Park to visitor accommodation at Denham and Monkey Mia; its spectacular scenery and wildlife values, including features of World Heritage significance; the diverse opportunities for nature-based recreation and tourism; and the heritage pastoral character and potential for development of the Peron Homestead precinct. The focus of recreation and tourism development across the Peron Peninsula will be (see also Map 6):

- to continue to acknowledge Peron Peninsula, in particular Peron Homestead, as an area of primary visitor focus in Shark Bay;
- in Francois Peron National Park, to further develop Peron Homestead as a two-wheel drive recreation and tourism destination for visitors by providing sealed access, visitor information, interpretation, education, day use, and overnight stays for special interest groups and nature-based commercial tourism opportunities whilst retaining the area's heritage and pastoral character;
- in Francois Peron National Park, to improve management of and rationalise existing recreation sites and develop additional day use and camping areas in the north-west part of the Peninsula as demand exceeds capacity at existing sites;
- in Francois Peron National Park to close Cattle Well to camping but retain as day use only;
- in Francois Peron National Park, to close the existing access and develop a new two-wheel drive sealed access into the day use site at Red Cliff;
- in Francois Peron National Park, to develop Guichenault Point (Herald Bight) as a day use recreation site that offers spectacular vistas and great opportunities to experience a diverse range of coastal features on the east coast;
- in Francois Peron National Park, to continue to implement the re-alignment of the main access track to Cape Peron and investigate the development of a loop track connecting the west and east coasts in the northern part of the peninsula;
- to consider developing opportunities for viewing nocturnal native fauna associated with Project Eden at Peron Homestead.
- in South Peron, to develop Eagle Bluff as a primary recreation day use site for visitors by providing additional interpretation and day use activities such as picnicking, walking and nature appreciation, with appropriate facilities;
- in South Peron to develop Dubaut Creek/Point as a primary recreation day use site for visitors by providing interpretation and day use activities such as picnicking, walking around the creek and nature appreciation, with appropriate facilities;
- on the east coast of South Peron, to continue to provide opportunities for four-wheel beach driving and beach camping;
- in South Peron, to investigate and assess potential sites for a two-wheel drive accessible bush camping experience and, after appropriate consultation, consider developing a single medium sized camp area in the southern part of South Peron;
- in South Peron, to develop an additional day use site near Shell Beach that offers elevated views of the beach and waters; and
- across the Peron Peninsula, to determine potential sites suitable for commercial, low impact, nature-based accommodation development and, after appropriate consultation and assessment, consider developing sites.

40.1 Recreation and Tourism Opportunities

For several years visitor numbers to Monkey Mia have remained between 85,000 to 115,000 visitors per annum (94,607 in 2009-10). If visitor numbers to Monkey Mia remain static, strategies that value-add and increase the length of stay of visitors by providing more opportunities will need to be developed. However, the proposal to expand the accommodation capacity of Monkey Mia Resort has been approved and this could lead to an increase in visitor numbers at this site over the life of this plan.

Visitor numbers to Francois Peron National Park have steadily increased and in 2009-10 were estimated to be 82,759 visitors per annum to the homestead site. Visitor numbers to the northern part of the park have increased as facilities and access have been improved and new opportunities provided. Visitor numbers to sites in South Peron are not known but are likely to be between the Shell Beach and Monkey Mia figures.

Visitor numbers to Shell Beach have fluctuated and in 2009-10 were estimated to be 124,731 visitors per annum. This is a day use site and most visitors remain in the park for only a short period of time. Shell Beach visitor numbers are unique in that many visitors to Shark Bay stop twice at Shell Beach, once on their arrival and once on their departure. This pattern of usage is unlikely to change.

In Francois Peron National Park, the most recent visitor surveys conducted in 2006 by the Department indicate that the main purpose for visiting was for holidaying and touring. The most popular activities were sightseeing, relaxing/reading and swimming followed by bushwalking, picnicking/barbequing, bird watching, camping and fishing. Local visitors have undertaken these activities for many years and have strong attachments to the area, particularly informal campsites along the coast.

There has been increasing interest in and demand for a range of nature-based recreation activities in Peron Peninsula, and it has become evident that people's expectations exceed the quality of facilities and experiences currently available. The baseline user survey conducted in Shark Bay in 1993 found that the most popular land-based activities for visitors were viewing the Monkey Mia dolphins (73.9%), sightseeing (62.2%), photography (57.8%), picnicking or barbecuing (49.6%), bushwalking (42%), shore-based fishing (40%), camping (40%), bird watching (36%) and four-wheel driving (36%). For residents, the three most popular activities undertaken were four wheel driving (60%), picnicking or barbecuing (60%) and viewing the Monkey Mia dolphins (58%). Surveys of visitors undertaken at Monkey Mia and Francois Peron in more recent years continue to confirm the above activities as the most popular with dolphin viewing remaining the most popular activity. Respondents also suggested that the Shark Bay area should be left as is and not over commercialised.

Currently, limited information has been collected about numbers, impacts, experiences and needs of visitors using recreation sites on the western side of South Peron.

40.1 – Recreation and Tourism Opportunities

Key Points

- Visitation to Francois Peron National Park has steadily increased whereas visitor numbers to Shell Beach Conservation Park have fluctuated in recent years.
- Currently, limited information has been collected about the numbers, impacts, experiences and needs of visitors using recreation sites on the western side of South Peron.

The objective is to provide visitors with a range of nature-based recreation and tourism opportunities within the Peron Peninsula that facilitate their enjoyment, understanding and appreciation of the key values.

This will be achieved by:

1. monitoring visitor numbers across a range of sites in the Peron Peninsula particularly sites in South Peron;
2. monitoring visitor satisfaction across a range of activities and sites in Peron Peninsula, particularly in relation to sites in South Peron; and
3. undertaking social research, including the Department's Visitor Satisfaction Survey and Visitor Statistics Program and projects nominated through the Nature Based Tourism Research Reference Group (see Section 57 – *Research and Monitoring*).

40.2 Access

Access roads and tracks available for public use on Peron Peninsula are shown in Table 7.

Table 7: Public Vehicle Access within Peron Peninsula[1].

Access	Management Setting	Current Standard	Proposed Standard	Comment
Peron Homestead	Recreation	2WD unsealed	2WD sealed	Realign & seal
Peron Peninsula	Natural-Recreation		4WD	New, alignment to be finalised
Big Lagoon Track	Natural-Recreation	4WD	4WD	New alignment proposed
Cattle Well	Natural-Recreation	4WD	4WD	Access by permit
South Gregories	Natural-Recreation	4WD	4WD	Unchanged
Gregories	Natural-Recreation	4WD	4WD	Unchanged
Bottle Bay	Natural-Recreation	4WD	4WD	Beach to be progressively closed to vehicles.

Access	Management Setting	Current Standard	Proposed Standard	Comment
Cape Peron & Skipjack Tracks	Natural-Recreation	4WD	4WD	Unchanged
North Peron loop	Natural-Recreation		4WD	New, alignment to be finalised
Herald Bight	Natural-Recreation	4WD	4WD	New alignment proposed
Guichenault Pt	Natural-Recreation	4WD	4WD	New alignment proposed
Red Cliff	Recreation	4WD	2WD sealed	Upgrade and realign as required
Shell Spit	Recreation	2WD unsealed	2WD unsealed	
Goulet Bluff	Recreation	2WD unsealed	2WD unsealed	Managed by Shark Bay Shire
East Goulet Blugg	Recreation	2WD unsealed	2WD unsealed	
Wilson Island	Natural-Recreation	4WD	4WD	Managed by Shark Bay Shire
Whalebone	Recreation	2WD unsealed	2WD unsealed	Managed by Shark Bay Shire
Fowlers Camp	Recreation	2WD unsealed	2WD unsealed	Managed by Shark Bay Shire
Eagle Bluff	Recreation	2WD unsealed	2WD sealed	Upgrade. Managed by Shark Bay Shire
Eagle Bluff Lagoon	Recreation	2WD unsealed	2WD unsealed	Managed by Shark Bay Shire
Dubaut Creek/Point	Natural-Recreation	4WD	4WD	Retain until new track built
Dubaut Creek (new)	Natural-Recreation	4WD	4WD	New, alignment to be finalised
Rocky Point/ Big Spit	Natural	4WD	4WD	Beach driving
Red Dunes	Natural	4WD	4WD	Beach driving
New Bore Track	Natural-Recreation	4WD	4WD	Unchanged
Shearing Shed Track	Natural-Recreation	4WD	4WD	Unchanged
Central East Track	Natural-Recreation	4WD	4WD	Retain until new Dubaut Ck track is constructed.
Proposed South Peron circuit	Natural-Recreation		4WD	New proposal on existing tracks
Shell Beach	Recreation	2WD unsealed	2WD unsealed	
Shell Beach	Recreation		2WD unsealed	New proposal

1. All other tracks not listed or shown on Map 6 are not available for public use and require a permit to use.

Two Wheel Drives

The construction of a new two-wheel drive sealed road from the Monkey Mia Road to the Peron Homestead precinct is a high priority to expand visitor opportunities and because the existing road is substandard. The new road will facilitate the development of the homestead precinct as a major site for Park management, visitor orientation, interpretation, education, and other recreational and commercial tourism uses.

Monkey Mia receives high number of visitors in the Shark Bay area. To cater for these visitors and provide alternative activities, the nearby Red Cliff will be developed as a day use site with a two-wheel drive sealed road provided and a walk trail to Monkey Mia. The severe erosion at Red Cliff will be addressed as part of its development.

To reduce the myriad of tracks along the western coast of South Peron, two-wheel drive access to the many sites will be rationalised with access to some sites upgraded whilst other sites downgraded or closed and rehabilitated. Eagle Bluff will be established as a primary interpretive node and the access upgraded to a two-wheel drive sealed road. Maintenance of access to many of these sites is currently managed by the Shire of Shark Bay. The future control and management of these roads will be subject to a Memorandum of Understanding between the

Department and the Shire of Shark Bay. Access to the sites on the eastern coast would be difficult to develop as two-wheel drive destinations and therefore remain four-wheel drive.

Four Wheel Drives

Many parts of Francois Peron National Park will remain accessible by four-wheel drive only (see Map 6). The four-wheel drive tracks to recreation sites in Francois Peron National Park are continually being improved to minimise negative environmental impacts and provide improved visual opportunities. A loop track connecting the west and east coasts is proposed in the northern part of Francois Peron National Park to provide improved connectivity between recreation sites and a different visual perspective for the visitor. Access to Cape Rose through a locked gate and key system will continue to be provided. Driving on the beach occurs in some parts of Francois Peron National Park such as Bottle Bay and Herald Bight. Where no alternative access is provided, beach driving will be allowed to continue. However, the intent of the management plan is to reduce beach driving as much as possible.

Many of the tracks in South Peron are straight, have been constructed adjacent to fence lines and traverse sensitive landforms such as birridas, dunes, algal mats and inter-tidal areas. Other tracks are located close to coastal cliffs and, as such, are subject to erosion from wind and over use. There are numerous tracks used to access the coastal sites on the western side of South Peron which are a mixture of two-wheel and four-wheel drive access. These tracks will be rationalised and upgraded, realigned closed or rehabilitated (see Map 6).

Access to the eastern coast of South Peron is only possible by four-wheel drive vehicle and, for the most part, will remain undeveloped with four-wheel drive beach access permitted (see Map 6). However, due to hazardous conditions and sensitive landforms, four-wheel drive access to some parts of the eastern coastline, Dubaut Creek to New Bore Track and the beach area to the west of Shell Beach, will be closed. Dubaut Creek is a popular camping and picnic site and close to Monkey Mia and as such has the potential for further development. Access to Dubaut Creek requires realignment to avoid steep dunes and birridas. Over time, tracks across the birridas in the eastern part of South Peron will be realigned to avoid these sensitive areas.

In South Peron a four-wheel drive loop will be developed to cater for the increasing numbers of recreation vehicle drivers visiting the Shark Bay area (see Map 6). All public access tracks on Peron Peninsula will be sign-posted according to Departmental standards, guidelines and World Heritage Property Style Guide recommendations.

Boat Access

Peron Peninsula offers many sites for boat access. The viability and management requirements of a long-distance kayak/canoe trail within the marine park around Peron Peninsula, which will require the provision of dedicated camping sites at regular distances along the coast is being investigated (see Section 33.3 – *Recreation Activities and Use – Overnight Stays*).

Air Access

Airports exist at Denham and Carnarvon with regular air services connecting Carnarvon and Denham/Monkey Mia to Perth and Geraldton.

Special Access

When Louis de Freycinet arrived in Shark Bay in 1818 in the *Uranie*, members of this French Scientific Expedition established a temporary camp at Cape 'Le Sueur' on the shores of the Peron Peninsula for several days (see Section 29 – *Non-Indigenous Heritage*). There was also an Aboriginal camp and large pearling camp located at Cape Lesueur and several other pearling-related sites in the vicinity. To ensure protection of sensitive cultural values, terrestrial access to the area will continue to require permission and be through a locked gate and camping by boat or sea kayak based visitors will not be permitted.

The movement of boats and diving around the Peninsula can disturb dolphins herding fish, mangrove areas and colonies of breeding or roosting birds such as cormorants, terns and pelicans resulting in eggs and hatchlings being taken by predatory birds. Restrictions, seasonal or permanent, on access to and around these breeding sites may need to be introduced where and when bird colonies are particularly sensitive to disturbance.

40.2 – Peron Peninsula - Access

Key Points

- Currently, two-wheel drive vehicle access to the coast is limited to Denham, Monkey Mia and some sites on the western coastline of South Peron.
- The remainder of Peron Peninsula is accessible by four-wheel drive.
- There are several sites on Peron Peninsula accessible by boat.
- An airstrip is located in Denham.

The objective is to provide a range of access types on Peron Peninsula that do not adversely impact on the key values of the planning area or visitor appreciation of these values and minimises conflict with other users.

This will be achieved by:

1. developing access in Peron Peninsula according to Table 7, Map 6 and strategies outlined in Section 32 – *Visitor Access*;
2. providing beach access for recreational driving on the east coast of the South Peron (yet to be named) Conservation Park; and
3. authorising access by permit to Cape Lesueur, Cape Rose and other areas with safety, cultural or specific natural values needing protection such as turtle nesting and bird breeding sites.

40.3 Recreation Use and Activities

Wildlife Encounters

Viewing the dolphins that regularly visit the shore at Monkey Mia has become a central theme for promoting the Shark Bay area. Visitor surveys continue to demonstrate that viewing the dolphins remains the most popular activity for visitors. Up to 500 people may congregate on the beach to view the dolphins.

An animal viewing facility has been proposed at the Peron Homestead. The facility will enable visitors to view the threatened species that are being bred and released onto Peron Peninsula in an enclosed but near-natural setting. One of the key objectives of *Project Eden* (see Section 21 – *Native Animals*) is to educate the community about wildlife conservation and the fauna being reintroduced.

Two sites, Skipjack Point at Cape Peron and Eagle Bluff in South Peron, have been developed to provide visitors with an opportunity to view the coastal landscape and seascape as well as the marine wildlife that occurs there. They are popular destinations and other coastal viewing sites may be developed during the life of the plan.

40.3 – Peron Peninsula – Recreation Use and Activities – Wildlife Encounters

Key Points

- Viewing dolphins at Monkey Mia and other marine wildlife at Skipjack Point and Eagle Bluff are popular activities for visitors to Peron Peninsula.
- An opportunity exists for the development of a fauna viewing facility at the Peron Homestead.

The objective is to provide opportunities for sustainable wildlife encounters within the Peron Peninsula that facilitate visitor enjoyment, appreciation and understanding.

This will be achieved by:

1. developing a purpose-built fauna viewing facility at Peron Homestead; and
2. developing other wildlife viewing sites and facilities as demand requires.

Scenic and Recreational Driving

Three specific recreational drive trails are proposed for the Peron Peninsula (see Map 60):

- in Francois Peron National Park, a loop connecting the west and east coasts in the northern part of the Park;
- in South Peron, a short circuit and a longer circuit that includes some beach driving on the east coast; and
- in South Peron and just north of Eagle Bluff, a loop adjacent to the coastline.

More general information relating to scenic and recreational driving in the planning area is described in Section 33.2 – *Recreation Activities and Use – Scenic and Recreational Driving*.

40.3 – Peron Peninsula – Recreation Use and Activities – Scenic and Recreational Driving

Key Points

- Visitors to Peron Peninsula seek both opportunities for scenic and recreational driving and destination-based access.

The objective is to provide opportunities for scenic and recreational driving within the Peron Peninsula that does not cause damage the environment, is safe and minimises conflict with other users.

This will be achieved by:

1. developing and promoting recreational driving loops in the Peron Peninsula according to Map 6.

Overnight Stays

Built Accommodation

The Peron Homestead contains basic homestead accommodation with rooms with bunks. The homestead is available for groups assisting the Department with programs including school groups, volunteers, special interest groups or groups undertaking training activities. This basic accommodation may be further developed to better cater for these types of groups. In recent years a homestead host arrangement has been developed to assist with management of the area. The provision of a wildlife viewing facility will add to the attraction of the homestead.

As part of the Naturebank project (see Section 34 – *Tourism and Commercial Operations*) several sites in Francois Peron National Park have been assessed for their potential for the development of low-impact nature-based accommodation. Further assessment is still required, which may result in all, some or none of these sites being developed.

Camping

Campsites, some with facilities, exist in the Francois Peron National Park and South Peron. Most of these sites are accessible by four-wheel drive only. Sites on Department-managed lands offer basic facilities and services including toilets and sometimes gas BBQs and furniture (see Map 6 and Table 8).

The existing campsites provided in Francois Peron National Park may reach capacity during the life of this plan. Some additional sites such as Broadhurst Bay, 18 Mile and Jimmy's Bay have been identified as being suitable for future development as camping areas and, in some cases, day use. However, this will require further assessment and detailed site planning. Cattle Well is proposed to be closed to camping and maintained as a day-use site.

Many sites in the proposed South Peron (yet to be named) Conservation Park have been used for camping and several sites on the west coast have combined day use and camping. Most of the west coast sites have environmental problems such as vegetation clearing, soil disturbance, waste management issues and require rubbish removal. During the life of this plan, a review of campsites across South Peron will be undertaken and a suitable site that provides for two-wheel drive accessible bushcamping will be identified and developed. Subject to this review and subsequent development, existing campsites on the west coast may be closed. In addition, the Eagle Bluff lookout will be closed to camping. On the east coast of South Peron, beach camping with minimal facilities and four-wheel drive access will be retained. Beach camping in the rest of the Peron Peninsula will not be permitted and will be phased out during the life of the plan.

There are several parts of the Peron Peninsula that are suitable for the developing campsites only accessible by boat. Specific sites along the South Peron coastline could be developed as boat only camping destinations which would provide a unique opportunity for people visiting the area. However, there is limited knowledge of the extent and frequency of boat access camping and surveys will need to be conducted before any specific campsites can be developed.

Table 8: Existing and Proposed Overnight Stays within Peron Peninsula.

Sites	Management Setting	Access	Comment
Existing sites			
Peron homestead	Highly modified	2WD vehicle	Major sized built accommodation
Big Lagoon	Natural-Recreation	4WD vehicle, boat	Minor sized campsite
South Gregories	Natural-Recreation	4WD vehicle	Minor sized campsite
Gregories	Natural-Recreation	4WD vehicle	Minor sized campsite
Bottle Bay	Natural-Recreation	4WD vehicle	Medium sized campsite
Herald Bight	Natural-Recreation	4WD vehicle	Minor sized campsite
Dubaut Creek/Point	Natural	4WD vehicle, boat	Minor sized campsite
Rocky Point/ Big Spit	Natural	4WD vehicle, boat	Minor sized campsite
Red Dunes	Natural	4WD vehicle, boat	Minor sized campsite
Eagle Bluff Lagoon	Recreation	2WD vehicle	Minor sized campsite
Fowlers Camp	Recreation	2WD vehicle	Minor sized campsite
Whalebone	Recreation	2WD vehicle	Minor sized campsite
Goulet Bluff	Recreation	2WD vehicle	Minor sized campsite
Existing sites that will be closed, moved or upgraded			
Big Lagoon	Natural-Recreation	4WD vehicle	Upgraded to medium sized campsite
Dubaut Creek/Point	Natural-Recreation	4WD vehicle, boat	Minor sized campsite
Cattle Well	Natural-Recreation	4WD vehicle	Closed, camping by permit only
Herald Bight	Natural-Recreation	4WD vehicle	Moved off beach
Eagle Bluff lookout	Recreation	2WD vehicle	Closed to camping
Eagle Bluff Lagoon	Recreation	2WD vehicle	Some of these campsites will be closed. Camping sites will be developed in South Peron, but locations are yet to be determined.
Fowlers Camp	Recreation	2WD vehicle	
Whalebone	Recreation	2WD vehicle	
Goulet Bluff	Natural-Recreation	2WD vehicle	
Proposed new sites			
North-west Peron Peninsula	Natural-Recreation	4WD vehicle	Campsites developed as required
Peron Peninsula	Natural-Recreation	4WD vehicle	Potential built accommodation at various sites
South Peron (new)	Natural-Recreation	2WD vehicle (seasonal)	Location of 2WD bush camp site to be determined

40.3 – Peron Peninsula – Recreation Use and Activities – Overnight Stays

Key Points

- Basic built accommodation is provided in the Peron Homestead in Francois Peron National Park.
- Campsites, sometimes with facilities, exist at Francois Peron National Park and South Peron.
- There is a lack of diversity of camping opportunities provided on Peron Peninsula.
- Existing campsites on Peron Peninsula have varying degrees of degradation and often reach capacity at busy times.

The objective is to provide opportunities for visitors to stay overnight within the Peron Peninsula in appropriately designed built accommodation and campsites, and that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of built accommodation opportunities consistent with the appropriate visitor management setting and as resources permit;
2. providing a range of camping opportunities with varying physical, structural and social facilities and managerial conditions at coastal sites (see Table 8 and Map 6);
3. within Francois Peron National Park, developing other campsites as existing sites exceed capacity or as required, whilst limiting the impacts on the natural values of the area;

4. in South Peron, providing a two-wheel drive bush camping area after assessing existing sites and proposed sites and determining the most appropriate site(s);
5. retaining beach camping on the east coast of South Peron and prohibiting beach camping in all other parts of Peron Peninsula.

Day-Use

Specific day-use only facilities are provided at Cape Peron / Skipjack Point, Peron Homestead, Shell Beach and Eagle Bluff. Many of the areas set aside for day use also contain camping including sites in Francois Peron National Park. The many combined day use and camping sites in South Peron require rationalisation to clarify where camping should and should not occur.

Existing and proposed day-used sites within Peron Peninsula are shown in Table 9 and Map 6.

Table 9: Existing and Proposed Day Use Sites within the Peron Peninsula

Site	Management Setting	Primary activities (existing and proposed)	Comment
Existing Sites			
Monkey Mia	Highly modified	Wildlife viewing, interpretation	Major day use site
Peron Homestead	Highly Modified	Interpretation, picnicking	Upgrade to major day and night use site
Big Lagoon [2]	Natural-Recreation	Sightseeing, picnicking, fishing	Medium day use site
Cattle Well	Natural-Recreation	Sightseeing, picnicking, fishing	Minor day-use site
South Gregories [2]	Natural-Recreation	Sightseeing, picnicking, fishing	Minor day use site
Gregories [2]	Natural-Recreation	Sightseeing, picnicking, fishing, water based	Minor day use site
Bottle Bay [2]	Natural-Recreation	Sightseeing, picnicking, fishing, water based	Medium day use site
Cape Peron	Natural-Recreation	Sightseeing, picnicking, fishing, walking	Medium day use site
Skip Jack Point	Natural-Recreation	Lookout, walking	Minor day use site
Herald Bight [2]	Natural-Recreation	Sightseeing, picnicking, fishing	Minor day use site
Cape Rose	Natural	Fishing	Minor day use site
Eagle Bluff / Lagoon	Recreation	Lookout, interpretation, picnicking	Major day use site
Whale Bone [2]	Recreation	Sightseeing, fishing	Minor day use site
Goulet Bluff [2]	Recreation	Lookout, sightseeing	Minor day use site
Fowlers Camp [2]	Recreation	Sightseeing	Minor day use site
Shell Beach	Recreation	Sightseeing, interpretation	Minor day use site
Dubaut Creek/Point	Natural-Recreation	Lookout, sightseeing, picnicking, fishing	Minor day use site
Proposed Sites			
Dubaut Creek/Point	Natural-Recreation	Sightseeing, interpretation, lookout	To be developed as medium interpretive and day-use site
Red Cliff	Recreation	Sightseeing, picnicking, fishing	To be developed as medium interpretive and day-use site
Shell Beach (new)	Recreation	Sightseeing, interpretation, lookout	New minor day use site
Guichenault Point	Natural-Recreation	Sightseeing, picnicking	To be developed as medium interpretive and day-use site

1. Sites listed are those that will have facilities.
2. Currently joint day use and camping areas but sites will be reviewed for dual activities during life of the plan.

40.3 – Peron Peninsula – Recreation Use and Activities – Day-Use

Key Points

- Specific day-use facilities are provided at Cape Peron / Skipjack Point, Peron Homestead, Shell Beach and Eagle Bluff.
- There are also several combined camping and day-use sites in Francois Peron National Park and South Peron.

The objective is to provide opportunities for visitors to stay during the day within the Peron Peninsula in appropriately designed sites, which facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of day use opportunities consistent with the appropriate visitor management setting and as resources permit (see Table 9 and Map 6).

Bushwalking

A summary of the existing and proposed walks across the planning area and their class is provided in Table 10 and Map 6. Within Peron Peninsula, short pedestrian trails have been developed at the Peron Homestead, Cape Peron / Skipjack Point, Eagle Bluff and Shell Beach. Across Peron Peninsula, more defined trails are proposed at Peron Homestead, Red Cliff and Cape Rose, Eagle Bluff and Shell Beach lookout. A longer trail is proposed between Denham and Eagle Bluff. Bush walking on undefined trails may also be undertaken.

Longer day or overnight walking may be undertaken in the planning area along unmarked tracks. Visitors intending to undertake such walks must seek permission from the District office. Other bushwalks may be developed as demand increases and after detailed planning, review of the management setting implications and public consultation.

Table 10: Walk Trails within the Peron Peninsula.

Walk	Management Setting	Proposed Class (1-6)*	Comment
Existing			
Station Life Walk	Recreation	2	
Hamelin Pool access	Recreation	2, 3	Several trails of varying classes.
Shell Beach access	Recreation	2	
Cape Peron to Skipjack Point	Natural-Recreation	2, 3	Several trails of varying classes.
Eagle Bluff	Recreation	1	
Proposed			
Bush walk – Peron Homestead	Recreation	3	To interpret flora and vegetation
Dubaut Creek/Point	Recreation	2, 3	Interpretive trail with boardwalks
Denham to Eagle Bluff	Recreation	2,3	
Eagle Bluff to Lagoon	Recreation	3	Connecting with existing walk
Shell Beach lookout	Recreation	3	

* - see Appendix 8: Department Classification of Walk Tracks

40.3 – Peron Peninsula – Recreation Use and Activities – Bushwalking

Key Points

- Within Peron Peninsula there are currently short pedestrian walks in the homestead precinct, Cape Peron / Skipjack Point, Eagle Bluff and at Shell Beach.

The objective is to provide opportunities for a range of bushwalks within the Peron Peninsula that are developed to an appropriate class, are safe, facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of bushwalking opportunities consistent with the criteria for each class of track and the appropriate visitor management setting (see Table 10 and Map 6).

Recreational Boating

Other long distance kayak/canoe trails may be developed in other parts of the planning area including Monkey Mia to Dubaut Creek and Petit Point, southern parts of Henri Freycinet Harbour, Bellefin Prong, Heirisson Prong and parts of the east coast of Dirk Hartog Island. Sea kayaking from Denham to Monkey Mia around Peron Peninsula is undertaken by individuals and tour operators.

Specific campsites may need to be developed to facilitate sea kayaking. Guidelines and information for sea kayaking will be developed. These guidelines may include party size, safe use, minimal impact camping, wildlife interaction and identify restricted sites because of high natural values. Potential areas for sea kayak trails may include:

- Denham to Monkey Mia;
- Denham to Big Lagoon; and
- Monkey Mia to Dubaut Creek.

40.3 – Peron Peninsula – Recreation Use and Activities – Recreational Boating

Key Points

- Sea kayaking is a popular activity in the calm waters adjacent to Francois Peron National Park.

The objective is to provide opportunities for recreational boating adjacent to the Peron Peninsula that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. developing sea kayak trails in the Peron Peninsula area.

40.4 Tourism and Commercial Operations

The provision of low-impact, nature-based accommodation encourages visitors to interact with and understand the natural, cultural and historical features of an area. There are several commercial tourism developments being considered across the Shark Bay area. The Naturebank project (see section 34 – *Tourism and Commercial Operations*) has assessed several sites in Francois Peron National Park. In addition, other potential low-impact nature-based accommodation sites exist within the planning area (see Section 33.3 – *Recreation Activities and Use – Overnight Stays*). The number of sites to be developed has yet to be determined.

The *Shark Bay Terrestrial Reserves Management Plan 2000-2009* (CALM 2000) identified Peron Homestead as being suitable for developing a tearoom, which is also recommended in this plan. Such a facility may be leased and, in association with viewing enclosure for threatened animals associated with Project Eden, may become a major tourism attraction for the area.

Fees are associated with all commercial tourist activities conducted on lands or waters managed by the Department. Companies conduct tours in Monkey Mia Reserve, Francois Peron National Park, and Shell Beach Conservation Park. Tour operators using parts of South Peron, will require a licence or a variation of their existing licence to operate.

There is currently no demand for commercial horse-riding in any of the terrestrial reserves although there may be ‘free-range’ riding in parts of South Peron outside the Denham town boundary. There is a pony club in Denham.

Camel treks conducted by a commercial operator occur on the beach area at Monkey Mia and, if expanded into nearby areas in the future, will need to undergo Department assessment process.

40.5 Domestic Animals

Currently, dogs are not permitted in Francois Peron National Park and this arrangement will continue. In South Peron, visitors currently take dogs, but once it becomes a conservation reserve, it is proposed to identify and designate specific areas of South Peron where dogs will be allowed. Other opportunities for people to take their pets onto lands exist on recreation reserves vested in local Shire of Shark Bay.

A significant risk for domestic animals such as dogs is that Peron Peninsula is baited with 1080 baits for fox control as part of Project Eden and appropriate signs warning of the risks are provided (see Section 21 – *Native Animals* and Section 24 – *Introduced and Problem Animals*).

40.5 – Peron Peninsula – Domestic Animals

Key Points

- Currently, visitors take dogs into South Peron, but dogs are not permitted in Francois Peron National Park.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:

1. not permitting domestic animals in the Francois Peron National Park, with the exception of guide dogs and dogs associated with search and rescue operations (see Section 24 – *Introduced and Other Problem Animals*); and
2. only permitting domestic animals in designated areas of Shell Beach Conservation Park and proposed South Peron (yet to be named) Conservation Park (see Section 24 – *Introduced and Other Problem Animals*).

41. NANGA PENINSULA

Following analysis to define the type and level of recreation that can be sustained on Nanga Peninsula, two visitor management settings have been proposed for the Peninsula which are 'Natural-Recreation' and 'Natural' (see Map 5). The visitor management setting for the northern tip of the peninsula is 'Natural-Recreation' which are areas dominated by natural vegetation and landscapes of conservation significance with some evidence of past human use. In this area the conservation of significant natural and cultural values is a priority, with low to medium level recreation. The visitor management setting for rest of the peninsula, including the area south of the Shark Bay Road, has a 'Natural' setting where the conservation of significant natural and cultural values is a priority, with low level recreation only.

The vision for Nanga Peninsula in the northern part, is to provide a four-wheel drive destination that offers a nature based recreation opportunity and experience in a natural environment that is managed for ecological restoration, and in the southern part to protect the unique natural values and retain the unspoilt naturalness of the area by providing for only a limited recreational opportunity.

Visitor numbers to Nanga Peninsula are likely to remain very low and access will remain four-wheel drive through a locked gate, with a key system for entry. Recreational use on the peninsula is likely to remain focussed on Petit Point because it is protected from the prevailing winds, and has relatively easy four-wheel drive vehicle access, limited beach camping, good fishing and beach boat launching. Recreational use in the southern part of the Peninsula is likely to remain predominantly water-based.

It is proposed to develop a single, more direct access route to Petit Point that avoids sensitive environmental areas such as the stromatolites and algal mats on the east coast, the shell beach areas on the west coast and the inter-tidal areas on the north-western tip of the peninsula (see Map 6). A day use site adjacent to the Shark Bay Road providing views of the Hamelin Pool Nature Reserve may be developed if required.

41.1 Recreation and Tourism Opportunities

Visitor numbers to Hamelin Pool, adjacent to Nanga Peninsula, have fluctuated and in 2009-10 were estimated to be 34,020 per annum. Determining visitor numbers to this site is difficult because the road is also used to access the adjacent Hamelin Pool Caravan Park.

41.2 Access

Access roads and tracks available for public use on Nanga Peninsula are shown in Table 11 and Map 6.

Table 11: Public Vehicle Access within Nanga Peninsula[1]

Access	Management Setting	Current Standard	Proposed Standard	Comment
Petit Point	Natural-Recreation	4WD	4WD	Access by permit and new alignment
Nanga Peninsula	Natural	4WD	4WD	Access by permit and new alignment

1. All other tracks not listed or shown on Map 6 are not available for public use and require a permit to use.

Four Wheel Drives

The Nanga Peninsula has several tracks previously used for pastoral purposes which are now used to carry out pest animal monitoring and, to a lesser extent, for visitor access. There are multiple tracks across the peninsula and these will be replaced with a single, designated track to Petit Point along a more direct route. The realigned track will avoid sensitive soils and vegetation as well as restrict access to the stromatolites and algal mats on the east coast of the Nanga Peninsula. This will better protect the important World Heritage values and reduce the risk of vehicles becoming bogged in these areas (see Map 6). Access to Petit Point through a locked gate with the key available from the Department's District office in Denham will continue to be provided. Access through the shell mining area will continue to be closed. The Hamelin Pool Marine Nature Reserve has high natural values especially the stromatolites and algal mats along the eastern coastline and, as such, access to the Reserve from the land on Nanga Peninsula will not be permitted. Public access to the Marine Nature Reserve area will continue to be provided at the Hamelin Pool Telegraph Station.

Boat Access

Although boat access will be allowed into much of the planning area, some areas such as the many islands and the east coast of Nanga Peninsula will be closed to camping.

Air Access

Within the planning area, one airstrip exists near Nanga resort just south of Goulet Bluff.

41.2 – Nanga Peninsula - Access

Key Points

- Access to the Nanga Peninsula is predominantly by four-wheel drive.
- Aircraft may access the Nanga Peninsula but the airstrip near Nanga is seasonal and therefore has limited availability.

The objective is to provide access on Nanga Peninsula that does not adversely impact on the key values of the planning area or visitor appreciation of these values and minimises conflict with other users.

This will be achieved by:

1. developing access on Nanga Peninsula according to Table 11, Map 6 and strategies outlined in Section 32 – *Visitor Access*; and
2. authorising access by permit to Nanga Peninsula and other areas where natural values require protection such as stromatolites and algal mats.

41.3 Recreation Use and Activities

Overnight Stays

Camping

Four-wheel drive accessible campsites, with no facilities exist on Nanga Peninsula at Petit Point (see Map 6 and Table 12). This site will remain the primary campsite on Nanga Peninsula and, consistent with the Natural-Recreation visitor management setting, basic facilities such as toilets may be provided.

Table 12: Existing and Proposed Overnight Stays within Nanga Peninsula.

Sites	Management Setting	Access	Comment
Existing sites			
Petit Point	Natural-Recreation	4WD vehicle	Minor sized campsite
Existing sites that will be closed, moved or upgraded			
Petit Point	Natural-Recreation	4WD vehicle	Upgraded to medium sized campsite

41.3 – Nanga Peninsula – Recreation Use and Activities – Overnight Stays

Key Points

- Camping on Nanga Peninsula mainly occurs at Petit Point.

The objective is to provide opportunities for visitors to stay overnight on the Nanga Peninsula in appropriately designed campsites, that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing camping opportunities on Nanga Peninsula (see Table 12 and Map 6).

Day-Use

Existing and proposed day-used sites on the Nanga Peninsula are shown in Table 13 and Map 6.

Table 13: Existing and Proposed Day Use Sites within Nanga Peninsula

Site	Management Setting	Primary activities	Comment
Existing Sites			
Petit Point	Natural-Recreation	Sightseeing, picnicking, fishing	Day use site
Existing sites that will be closed, moved or upgraded			
Petit Point	Natural-Recreation	4WD vehicle	Upgraded to medium sized day use site

41.3 – Nanga Peninsula – Recreation Use and Activities – Day-Use

Key Points

- Day-use on Nanga Peninsula mainly occurs at Petit Point.

The objective is to provide opportunities for visitors to stay during the day on the Nanga Peninsula in appropriately designed sites, which facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:
1. providing a range of day use opportunities consistent with the appropriate visitor management setting and as resources permit (see Table 13 and Map 6).

Water-based Activities

There are many sites across Shark Bay that are used for diving and snorkelling including places adjacent to Nanga Peninsula, especially in the many sheltered bays and inlets. Some specific sites across the planning area may be developed and promoted as diving and snorkelling destinations. Access to the Hamelin Pool Marine Nature Reserve is only possible when accompanied by a Departmental officer. This will apply to snorkelling and diving activities from the coastline of the eastern side of Nanga Peninsula.

More general information relating to water-based activities in the planning area is described in Section 33.8 – *Recreation Activities and Use – Water-based Activities*.

41.3 – Nanga Peninsula – Recreation Use and Activities – Water-Based Activities

Key Points
- Sheltered bays and inlets adjacent to the Nanga Peninsula are popular for diving and snorkelling.

The objective is to provide opportunities for water based activities on the Nanga Peninsula that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts and conflict with other users.

This will be achieved by:
1. providing information and facilities to promote water-based activities and minimise the impact of these activities on the native fauna, environment and other users.

41.4 Tourism and Commercial Operations

Private tourism developments exist and others are likely to be proposed for the planning area. It is important that such tourism developments do not adversely impact on World Heritage and other key values and these are monitored through the approvals process. Commercial tourism accommodation has been proposed on freehold land at Nanga. All the existing and proposed developments have implications for the whole Shark Bay area.

Other leases may be developed for other facilities such as communications towers and airstrips. The airstrip located near Nanga is a bush airstrip and a permit issued for its use and maintenance. It is proposed that a formal lease be established for its use.

Fees are associated with all commercial tourist activities conducted on lands or waters managed by the Department. Companies conduct tours on Nanga Peninsula and tour operators will require a licence to operate.

41.5 Domestic Animals

Dogs will not be permitted on Nanga Peninsula (in the proposed Nanga Conservation Park). Other opportunities for people to take their pets onto lands may exist on recreation reserves vested in local Shire of Shark Bay.

41.5 – Nanga Peninsula – Domestic Animals

Key Points
- No dogs are permitted on Nanga Peninsula.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:
1. not permitting domestic animals on the Nanga Peninsula, with the exception of guide dogs and dogs associated with search and rescue operations (see Section 24 – *Introduced and Other Problem Animals*).

42. ZUYTDORP AREA

The visitor management setting for the Zuytdorp area is 'Natural' which applies to remote areas of conservation significance (see Map 5). The southern part of Tamala Station and Nanga Station and the northern part of Murchison House Station have never been fully developed for pastoral purposes. As such these reserve additions contain areas of relatively undisturbed, contiguous vegetation.

The vision for the Zuytdorp area is to protect the natural values and therefore provide for only very limited recreational opportunities near the coast in the southern part of the area.

42.1 Access

Special Access

There are very few tracks in the Zuytdorp area and, consequently, visitor numbers to the Zuytdorp area are likely to remain very low. Access to the Zuytdorp coast is from the south through Murchison House Station or from the east via the State Barrier Fence. Access from the north through Tamala Station is not permitted. All access routes require permission. Existing tracks will be retained and no new ones provided. Currently people visiting the area via the State Barrier Fence require permission from the Agricultural Protection Board through the Department of Agriculture and Food and if visiting the site of the *Zuytdorp* shipwreck from the WA Museum. These arrangements will continue to apply but may be expanded or formalised by the Department to provide valuable visitor information, control where visitors can travel, allow limits to be placed on the number of vehicles, outline appropriate behaviour and provide a means for informing visitors on how they can best avoid disturbing the site whilst visiting the area. Access through any of the pastoral leases will require the permission of the lease holders. Public access to other parts of the reserve will not be provided. Although the area will not be promoted for recreation, the low level of camping that occurs adjacent to the Zuytdorp Cliffs will continue to be allowed.

The *Roads 2020 Regional Road Development Strategy Midwest* (MRWA 1997) identified a proposal for a two-wheel drive coastal route from Kalbarri to the Useless Loop Road (130 kilometres) which would reduce the time of the current journey between Kalbarri and Denham, via the North West Coastal Highway. The proposed route would traverse existing and proposed conservation reserves for most of the distance. The area contains the botanical transition zone between the Southwest and Eremaean botanical provinces and has many threatened flora species. It contains numerous Aboriginal sites and scenic values as well as meeting wilderness criteria. The Department believes the two-wheel drive proposal has significant environmental, cultural and social implications and is not consistent with the management settings or wilderness quality of the area. Therefore the proposal is not supported by the Department.

42.1 – Zuytdorp Area - Access

Key Points

- Access into the Zuytdorp area is difficult and restricted to four-wheel drives only.
- Currently, permits are required to visit the Zuytdorp coast.

The objective is to provide access in the Zuytdorp area that does not adversely impact on the key values of the planning area or visitor appreciation of these values and minimises conflict with other users.

This will be achieved by:

1. authorising access by permit to the southern coastal part of the Zuytdorp area.

42.2 Recreation Use and Activities

Overnight Stays

Camping

In the Zuytdorp area, a single shack has been constructed by abalone fishermen and is used as a camping base while fishing. Given the low level of use and during a restricted season, consistent with the State Government Squatter Policy, commercial abalone fishing will continue to be permitted to use the shack.

More general information relating to camping activities in the planning area is described in Section 33.3 – *Recreation Activities and Use – Overnight Stays*.

43. EDEL LAND

Following analysis to define the type and level of recreation that can be sustained on Edel Land, a number of visitor management settings have been proposed for the peninsula including 'Recreation', 'Natural-Recreation' and 'Natural' (see Map 5). Heirisson and Bellefin Prongs and the hinterland areas have a 'Natural' visitor management setting. The primary recreation sites at Steep Point with four-wheel drive access has a 'Recreation' visitor management setting, whilst those with four-wheel drive access have a 'Natural-Recreation' setting.

The vision for Edel Land is to provide four-wheel drive destinations that offer a range of nature-based recreation and tourism opportunities and experiences in a remote and natural environment.

The vast areas of shrubland and extensive stretches of coastline offer opportunities for recreation activities in a remote and natural environment. The most popular activities include four-wheel driving along remote coastlines, beach and rock fishing and camping. Other activities which may become popular in the future include bushwalking, sea kayaking and nature appreciation, both marine and terrestrial.

Some coastal sites are of a poor standard with evident signs of landscape degradation and loss of amenity. Some sites, notably coastal cliffs, present safety risks to visitors. Natural features of special attraction to visitors are largely coastal – beaches, cliffs, dunes, headlands and pristine coastlines.

There are two primary destinations in Edel Land: Steep Point/Shelter Bay and False Entrance. Visitor numbers are expected to remain low unless additional facilities and infrastructure are provided. The focus of recreation and tourism development across Edel Land will be (see also Map 7):

- retain Shelter Bay and Steep Point as four-wheel drive destinations;
- develop a day use site at Steep Point in the vicinity of the lighthouse/cairn with appropriate facilities and services, including interpretation of the site as the most westerly point on the Australian mainland;
- at Shelter Bay, develop alternative camping areas of different types and styles to protect turtle nesting sites, reduce visitor risks associated with tidal surge, reduce the impacts of increasing visitation and the associated environmental degradation;
- at Shelter Bay, to determine potential sites suitable for alternative types and styles of commercial, low impact, nature-based accommodation and, after appropriate consultation and assessment, consider developing of these;
- to develop walk trails at False Entrance to provide views of the Zuytdorp Cliffs and between Shelter Bay and Steep Point;
- to develop and promote the Zuytdorp Cliffs at False Entrance as a four-wheel drive destination, and providing appropriate day use and camping facilities;
- to develop the 'Steep Point' and 'Thunder Bay' recreational driving loops south of Steep Point;
- to apply a permit system for visitors planning to access the area between Thunder Bay and False Entrance, including Crayfish Bay, because of visitor risk issues;
- as required, to provide appropriate visitor risk management facilities and infrastructure at recreation sites, especially sites adjacent to cliffs;
- to provide Department standard information, directional and management signs across the area; and
- to develop interpretive nodes at the Useless Loop Road – Shark Bay Road intersection, False Entrance Road turn-off, False Entrance, Shelter Bay and Steep Point.

43.1 Recreation and Tourism Opportunities

In 2009-10 visitor numbers per annum to False Entrance were estimated to be 1,745 and to Steep Point to be 9,915 persons.

Survey results indicate that just over half of the people visiting the area are first time visitors, although there is a significant number who visit at least once a year. The percentage of visitors in each age group is roughly equally divided between 25-39, 40-59 and 60 and over classes.

There is limited information about the impacts of visitors in the Steep Point/Shelter Bay area and the experiences and needs of visitors at specific sites in Edel Land.

43.1 – Edel Land – Recreation and Tourism Opportunities

Key Points

- Visitation to Steep Point has steadily increased in recent years.
- There is limited information about the impacts of visitors in the Steep Point/Shelter Bay area and the experiences and desires of visitors at specific sites in Edel Land.

The objective is to provide visitors with a range of nature-based recreation and tourism opportunities within Edel Land that facilitate their enjoyment, understanding and appreciation of the key values.

This will be achieved by:

1. monitoring visitor numbers across a range of sites in Edel Land;
2. monitoring visitor satisfaction across a range of activities and sites in Edel Land; and
3. undertaking social research, including the Department's Visitor Satisfaction Survey and Visitor Statistics Program and projects nominated through the Nature Based Tourism Research Reference Group (see Section 57 – *Research and Monitoring*).

43.2 Access

Access roads and tracks available for public use in Edel Land are shown in Table 14 and Map 7.

Table 14: Public Vehicle Access within Edel Land[1]

Access	Management Setting	Current Standard	Proposed Standard	Comment
Steep Point Track	Natural-Recreation	4WD	4WD	Realign as required
Proposed Steep Point loop	Natural-Recreation		4WD	New proposal on existing tracks
Proposed Thunder Bay loop	Natural-Recreation		4WD	New proposal on existing tracks
False Entrance Road	Natural-Recreation	4WD	4WD	Realign away from low lying areas

1. All other tracks not listed or shown on Map 7 are not available for public use and require a permit to use.

Four Wheel Drives

The junction of the Useless Loop Road and False Entrance access track could be developed as a park entry and interpretation node for the proposed Edel Land National Park. False Entrance will be developed and promoted as both a day use and overnight camping destination. The access road to Steep Point past the Useless Loop turn-off initially wanders in and out of the Shark Bay Salt mining lease. Responsibility for this road will need to be clarified for maintenance purposes and to provide for public access to Steep Point.

Access to parts of Edel Land is difficult, hazardous and remote because of the unconsolidated dune fields and visitors have been known to become lost and bogged. Some parts of the main access route into Steep Point will require modification to address hazards such as the narrowness of the track. Access into remote areas such as Crayfish Bay will require a permit because of safety concerns (see Map 7). Tracks located close to coastal cliffs which are subject to erosion from wind and those that traverse sensitive landforms and habitats will require

realignment. At present vehicle access to the beach camping areas at Shelter Bay is having some impact on the beach environment and may need to be relocated further inland. The Steep Point area contains many tracks that have been closed but are slow to rehabilitate. For the most part these tracks will remain closed and rehabilitation actively encouraged.

Currently there is no vehicle access to Bellefin Prong and, although goats are present, it has never been developed for grazing. The area has high natural value and vehicle access will not be provided although walk-in access will be permitted. Vehicle access to Heirisson Prong is through the Shark Bay Salt mine lease at Useless Loop and access to this area requires the permission of the mine operators. Local residents of Useless Loop use this area for recreational driving, picnicking and camping but it is also the site of the Heirisson Prong Biosphere Reserve project (see Section 21 – *Native Animals*). Therefore only authorised access will be permitted and will be subject to permit conditions.

Using existing tracks, two loop drive trails south of Steep Point are proposed (see Table 14 and Map 7). All public access tracks across Edel Land will be sign-posted according the Departmental standards, guidelines and World Heritage Property Style Guide recommendations.

Boat Access

Although boat access will be permitted adjacent to much of Edel Land, some areas including the many islands off the coast of Bellefin Prong, will be closed to camping.

Visitors wishing to take their vehicles from Edel Land to Dirk Hartog Island National Park currently do so via a barge across South Passage, operated by the pastoral lessees of the island. The only safe landing site on Edel Land for the barge is in Shelter Bay and this will continue over the life of the plan.

Air Access

There is an unsealed airstrip at Useless Loop.

43.2 – Edel Land - Access

Key Points

- Access to Edel Land is by four-wheel drive.
- There is an unsealed airstrip at Useless Loop.
- The landing area for the barge which transports vehicles to Dirk Hartog Island National Park is located in Shelter Bay.

The objective is to provide access on Edel Land that does not adversely impact on the key values of the planning area or visitor appreciation of these values and minimises conflict with other users.

This will be achieved by:

1. developing access in Edel Land according to Table 14, Map 7 and strategies outlined in Section 32 – *Visitor Access*;
2. authorising access by permit to the northern part of Heirisson Prong, Thunder/Crayfish Bays and other areas with safety, cultural or specific natural values needing protection such as turtle nesting and bird breeding sites;
3. restricting vehicle access to and camping on Bellefin Prong and only permitting walk-in and boat access; and
4. continuing to provide a landing point in Shelter Bay for barge access between Edel Land and Dirk Hartog Island National Park.

43.3 Recreation Use and Activities

Wildlife Encounters

Turtles are known to nest in Shelter Bay on Edel Land. The impacts of visitors on nesting turtles can be difficult to manage as laying sites vary from year to year. To date, there has been no formal monitoring of the turtle populations at Shelter Bay. Research and monitoring in this area is required to develop appropriate management

strategies. Adverse effects can be minimised through visitor education, restricting vehicle or boat access on beaches, and the appropriate siting and design of facilities. For visitor-turtle interaction, protocols previously established for the Cape Range-Ningaloo area may be required, including the accreditation of tour operators (CALM 2005c).

43.3 – Edel Land – Recreation Use and Activities – Wildlife Encounters

Key Points

- Turtles are known to nest in Shelter Bay, although the importance of the site as a nesting area and the impact of visitors is unknown.

The objective is to provide opportunities for sustainable wildlife encounters within Edel Land that facilitate visitor enjoyment, appreciation and understanding.

This will be achieved by:

1. commencing turtle population monitoring at Shelter Bay (see Section 21 – *Native Animals*).

Scenic and recreational driving

Two specific recreational drive trails are proposed for Edel Land:

- the Steep Point Circuit, a short loop track to the south of Steep Point before returning to Shelter Bay; and
- the Thunder Bay Circuit, a longer loop track south from Steep Point to Thunder Bay before returning to Shelter Bay via the main entry track.

43.3 – Edel Land – Recreation Use and Activities – Scenic and Recreational Driving

Key Points

- Visitors to the Edel Land seek both opportunities for scenic and recreational driving and destination-based access.

The objective is to provide opportunities for recreational driving on Edel Land that does not cause damage to the environment, is safe and minimises conflict with other users.

This will be achieved by:

1. developing two recreational driving circuits in Edel Land;
2. developing and promoting a code of conduct for driving on Edel Land with consideration for issues such as tyre pressure, appropriate speeds and the size and type of vehicles; and
3. maintaining a marked track across the sand dunes at Steep Point and informing drivers that leaving the marked route is not permitted.

Overnight Stays

Camping

Mostly four-wheel drive accessible campsites, some with facilities, are located on Edel Land (see Map 7 and Table 15).

People planning to visit Steep Point are currently required to pre-book their visit to ensure security of one of the limited number of campsites. This booking arrangement will remain in place and eventually may be expanded to all campsites across the planning area.

Camping on the beach at Shelter Bay and on the rock shelf at Steep Point reaches capacity during peak periods. There is a need to develop alternative areas away from the coastline to address capacity issues and minimise environmental impacts on nesting turtles, vegetation, soils and visitor safety risks from flooding from recent tsunami events. Visitors have also expressed a desire for alternative types of camping with different styles of accommodation. Implementation of turtle monitoring will assess whether camping and associated activities have any negative impacts on nesting turtles.

There are several parts of Edel Land that are suitable for the development of campsites only accessible by boat. Specific sites along the eastern coastline of Edel Land could be developed as camping destinations only accessible by boat which would provide a unique opportunity for people visiting the area. However, there is limited knowledge of the extent and frequency of boat access camping and surveys will need to be conducted before specific campsites are developed.

Table 15: Existing and Proposed Overnight Stays within Edel Land.

Sites	Management Setting	Access	Comment
Existing sites			
False Entrance	Natural-Recreation	4WD vehicle	Minor sized campsite
Shelter Bay (Blackies)	Natural-Recreation	4WD vehicle	Medium sized campsite
Shelter Bay (east end)	Natural-Recreation	4WD vehicle	Medium sized campsite
Shelter Bay (west end)	Natural-Recreation	4WD vehicle	Medium sized campsite
Steep Point	Natural-Recreation	4WD vehicle	Minor sized campsite
Existing sites that will be closed, moved or upgraded			
False Entrance	Natural-Recreation	4WD vehicle	Upgrade camping area to medium size
Shelter Bay (Blackies)	Natural-Recreation	4WD vehicle	Potential nature-based accommodation
Proposed new sites			
Shelter Bay (new)	Natural-Recreation	4WD vehicle	Potential new campsites and built accommodation at sites to be determined

43.3 – Edel Land – Recreation Use and Activities – Overnight Stays

Key Points

- Currently, camping on Edel Land occurs at Steep Point, Shelter Bay and False Entrance.
- Capacity in these areas has reached its limit and new areas are required away from the coastline to minimise environmental impacts.

The objective is to provide opportunities for visitors to stay overnight on Edel Land in appropriately designed built accommodation and campsites, that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of built accommodation opportunities consistent with the appropriate visitor management setting and as resources permit;
2. providing a range of camping opportunities with varying physical, structural and social facilities and managerial conditions at coastal sites as listed in Table 15;
3. at Shelter Bay, developing alternative campsites away from the beach;
4. restricting access to and rehabilitating campsites impacted by inappropriate or overuse or where there are unacceptable environmental impacts; and
5. if turtle monitoring indicates the use of Shelter Bay by nesting turtles, regulating access and camping to parts of Shelter Bay when turtle nesting occurs.

Day-Use

On Edel Land, many of the areas set aside for day use also contain camping sites. Sites in the Steep Point-Shelter Bay area are used for both day use and camping and there is a need to separate day use and develop facilities and interpretation for day visitors, especially at Steep Point. Improved day use sites are also proposed for False Entrance. Day use will not be permitted in turtle nesting areas during nesting season. If demand exceeds capacity during the life of this plan, other sites may be developed for day use.

Existing and proposed day-used sites within Edel Land are shown in Table 16 and Map 7.

Table 16: Existing and Proposed Day Use Sites within the Edel Land

Site	Management Setting	Primary Activities (existing and proposed)	Comment
Existing Sites			
False Entrance [2]	Natural-Recreation	Sightseeing, picnicking, fishing, walking	Upgrade. Location to be determined
Shelter Bay [2]	Natural-Recreation	Sightseeing, 4WD, interpretation, walks	Upgrade. Location to be determined
Steep Point [2]	Natural-Recreation	Lookout, sightseeing, 4WD	Upgrade. To be developed at lighthouse/ cairn site
Proposed Sites			
Useless Loop turn-off	Highly modified	Interpretation	To be developed as minor interpretive site
False Entrance turn-off	Recreation	Interpretation	To be developed as minor interpretive site

1. Sites listed are those that will have facilities.
2. Currently joint day use and camping areas but sites will be reviewed for dual activities during life of the plan.

43.3 – Edel Land – Recreation Use and Activities – Day-Use

Key Points

- Currently, day-use in Edel Land occurs at Shelter Bay, Steep Point and False Entrance.

The objective is to provide opportunities for visitors to stay during the day within Edel Land in appropriately designed sites, which facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of day use opportunities consistent with the appropriate visitor management setting and as resources permit (see Table 16 and Map 7); and
2. if turtle monitoring indicates the use of Shelter Bay by nesting turtles, regulating access and day use to parts of Shelter Bay when turtle nesting occurs.

Bushwalking

The Edel Land area offers opportunities for short walks to features such as the Steep Point light beacon, Zuytdorp Cliffs and lookout points. A walk connecting Shelter Bay and Steep Point is proposed along the cliff edge. The Zuytdorp Cliffs and sites with blow-holes present an opportunity for visitors to view these unique features but also present a challenge for visitor risk management.

A summary of the existing and proposed walks in Edel Land and their class is provided in Table 17 and Map 7. Longer day or overnight walking may be undertaken in the planning area along unmarked tracks. Visitors intending to undertake such walks must seek permission from the District office. Other bushwalks may be developed as demand increases and after detailed planning, review of the management setting implications and public consultation.

Table 17: Walk Trails within Edel Land

Walk	Management Setting	Proposed Class (1-6)	Comment
Proposed			
Shelter Bay to Steep Point	Natural-Recreation	3	To interpret landscapes / seascapes
False Entrance Zuytdorp Cliffs	Natural-Recreation	3	To interpret cliffs and formations

43.3 – Edel Land – Recreation Use and Activities – Bushwalking

Key Points

- Currently, no facilities for bushwalking are provided in Edel Land, although there are many opportunities for short walks in the area.

The objective is to provide opportunities for a range of bushwalks within Edel Land that are developed to an appropriate class, are safe and that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of bushwalking opportunities consistent with the criteria for each class of track and the appropriate visitor management setting (see Table 17).

Recreational Boating

There are many opportunities for boating in the bays adjacent to Edel Land. Visitors to Shelter Bay use the bay for both powered and non-powered boats. There is also a landing point in Shelter Bay for barge access between Edel Land and Dirk Hartog Island National Park (see Section 43.2 – *Edel Land – Access*).

Shark Bay offers great potential for sea kayaking in the many sheltered bays and lagoons. Sea kayaking in the sheltered bays of Edel Land is also likely to become a popular activity. Specific campsites may need to be developed for sea kayaking. Guidelines and information to assist in undertaking sea kayaking will be developed. The guidelines could include party size, safety, minimal impact camping, wildlife interaction and identify restricted sites because of high natural values. Potential areas for sea kayak trails may include:

- Shelter Bay to Heirisson Prong; and
- Carrarang Peninsula to Disappointment Loop.

43.3 – Edel Land – Recreation Use and Activities – Recreational Boating

Key Points

- Sea kayaking in the sheltered bays of Edel Land is likely to become a popular activity and destination.

The objective is to provide opportunities for recreational boating adjacent to Edel Land that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. developing sea kayak trails in the Edel Land area.

43.4 Visitor Safety

Rock fishing from areas on the west coast of Edel Land has resulted in a number of deaths from drowning. The Department is currently investigating the practicalities of providing a range of devices to address this risk such as buoyancy devices and fixed tie off points and, in consultation with fishers, these will be considered for parts of the planning area.

The main factors that have contributed to safety incidents in the planning area are the arid climate, king waves, strong winds, hazardous terrain and remoteness. In 2006, beach campsites at Shelter Bay were swamped by a tidal surge as a result of a tsunami in Asia. Most of these risks can be largely managed by providing pre-visit information and on-site signs at strategic locations. Additional on-site facilities may be required, such as the establishment of safe lookout sites at key recreation areas on the coastal cliffs.

43.4 – Edel Land – Visitor Safety

Key Points

- Edel Land has not been formerly assessed for visitor risk and the limestone cliffs along the west coast

are potentially high risk areas.

The objective is to minimise risks to the public who visit Edel Land while maintaining a range of visitor experiences.

This will be achieved by:
1. adopting codes of safe conduct for popular activities (such as four-wheel driving, hiking, swimming, fishing, sea kayaking and surfing) and promoting and publicising them as appropriate.

43.5 Tourism and Commercial Operations

The newly constructed residence at Shelter Bay, known as the "Shelter Bay buildings" was constructed by the previous Carrarang pastoral station lease holders. The buildings are to be retained by them under a lease arrangement with, in the short term, the Department for Regional Development and Lands. Eventually it is proposed the area become a section 5(1)(h) reserve and leased under the CALM Act.

Fees are associated with all commercial tourist activities conducted on lands or waters managed by the Department. Companies conduct tours to Edel Land. Tour operators using parts of Edel Land will require a licence or variation of existing licence to operate.

43.6 Domestic Animals

When Edel Land was part of the Carrarang pastoral lease, dogs were permitted at Steep Point and Shelter Bay. However, the area is proposed to become national park and, once created, dogs will no longer be permitted on Edel Land. Other opportunities for people to take their pets onto lands exist on recreation reserves vested in local Shire of Shark Bay.

43.6 – Edel Land – Domestic Animals

Key Points
- When the area was managed as a pastoral lease, dogs were permitted at Steep Point and Shelter Bay.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:
1. not permitting domestic animals in the proposed Edel Land National Park, with the exception of guide dogs and dogs associated with search and rescue operations (see Section 24 – *Introduced and Other Problem Animals*).

44. DIRK HARTOG ISLAND

Following analysis to define the type and level of recreation that can be sustained on Dirk Hartog Island National Park, a number of visitor management settings have been proposed for the Island including 'Highly Modified', 'Recreation', 'Natural-Recreation' and 'Natural' (see Map 5). The hinterland areas have a 'Natural' setting, where the conservation of significant natural and/or cultural values is a priority and there are low levels of recreation. The primary recreation sites to be developed will have a 'Natural-Recreation' setting. In these areas, the conservation of significant natural and cultural values is a priority, with low to medium level recreation. The proposed lease at Cape Levillain and the Cape Inscription lighthouse area have a 'Recreation' setting. Areas with a 'Recreation' setting have the provision for moderate intensity recreation in a mostly natural landscape. The freehold homestead and proposed adjacent lot and the proposed Sunday Island Bay freehold lots have a 'Highly Modified' setting. In these areas there will be high-level recreation, education and interpretation and group activities specifically catered for.

The vision for Dirk Hartog Island National Park is to provide a combination of four-wheel drive destinations that offer a range of nature-based recreation, tourism opportunities and experiences in a remote and natural environment that is managed for ecological restoration.

The vast areas of shrubland and extensive stretches of coastline offer opportunities for recreation activities in a remote and natural environment. The most popular activities include beach and rock fishing, camping and four-wheel driving along remote coastlines. Other activities which may become popular in the future include nature appreciation, both marine and terrestrial, heritage appreciation, water-based activities that can be undertaken from the beach such as snorkelling, diving, swimming and sea kayaking and bushwalking.

Recreation sites across Dirk Hartog Island National Park have evolved without consideration for long term sustainability. Coastal sites are generally of a poor standard with signs of landscape degradation and loss of amenity evident. Huts suitable for overnight accommodation have been constructed at West Point, Urchin Point and Withnell Point. The lighthouse keeper's quarters are being restored by the Shire of Shark Bay and may eventually provide overnight accommodation. Some recreation sites, notably coastal cliffs, present safety risks to visitors. Natural features of special attraction to visitors are largely coastal – beaches, cliffs, dunes and headlands.

Most people visiting the island stay overnight at the homestead, with some staying in one of the four huts or camping on a beach at several sites along the east coast. Visitor numbers to Dirk Hartog Island National Park have been estimated to be less than 500 per year (excluding visitors to the homestead). Visitor numbers are expected to remain low unless additional facilities and infrastructure are provided. Boat access is expected to increase slightly.

Development of ecotourism accommodation on the freehold lots at the homestead and Sunday Island Bay has implications for visitor management, the ecological restoration project and the natural environment of the rest of the island. However, the intent of this management plan is to retain the character of the island as a remote destination in a largely natural, unmodified environment. The focus of recreation and tourism development across Dirk Hartog Island National Park will be (see also Map 8):

- develop a limited number of bush camping sites with alternative types and styles of facilities;
- initially limit the number of private vehicles on the island at any time to 10 per day (including tour operator's vehicles);
- develop the 'Mystery' recreation vehicle drive circuit connecting Sandy Point, Cape Inscription and Quoin Head;
- develop walk trails from Cape Inscription lighthouse to Turtle Bay, short walks at historical features such as Quoin Bluff South and Notch Point and other short walks to various features;
- as required, provide appropriate visitor risk management facilities and infrastructure at recreation sites, especially sites adjacent to cliffs;
- provide Department standard information, directional and management signs across the island; and
- develop interpretive nodes at Cape Ransonnet, the proposed Department's operations base near Herald Bay and at Cape Inscription.

44.1 Access

Access roads and tracks available for public use on Dirk Hartog Island are shown in Table 18.

Table 18: Public Vehicle Access on Dirk Hartog Island National Park [1]

Access	Management Setting	Current Standard	Proposed Standard	Comment
Dirk Hartog Track	Natural-Recreation	4WD	4WD	Unchanged
Surf Point	Natural-Recreation	4WD	4WD	Unchanged
DHI Blowholes	Natural-Recreation	4WD	4WD	Unchanged
Notch Point	Natural-Recreation	4WD	4WD	Unchanged
Quoin Bluff South	Natural-Recreation	4WD	4WD	Unchanged
Herald Bay	Natural-Recreation	4WD	4WD	Unchanged
Louisa Bay	Natural-Recreation	4WD	4WD	Unchanged
Sandy Point	Natural-Recreation	4WD	4WD	Unchanged
Withnell Point	Natural-Recreation	4WD	4WD	Unchanged
Cape Levillain	Natural-Recreation	4WD	4WD	Unchanged
Urchin Point	Natural-Recreation	4WD	4WD	Unchanged
West Point	Natural-Recreation	4WD	4WD	Unchanged

Access	Management Setting	Current Standard	Proposed Standard	Comment
Mystery Beach	Natural-Recreation	4WD	4WD	Unchanged
Charlies Harbour / Quoin Head	Natural-Recreation	4WD	4WD	Unchanged
Proposed Mystery Beach circuit	Natural-Recreation		4WD	New proposal on mostly existing tracks

1. All other tracks not listed or shown on Map 8 are not available for public use and require a permit to use.

Four Wheel Drives

Vehicle access to Dirk Hartog Island National Park is by a single vehicle barge operated by the current pastoral lease holders, which effectively limits the number of vehicles that visit the island. In the past, the number of private vehicles on the island has been limited to 10 at any one time. The number of private vehicles, including any tour operator and service vehicles, on the island at any one time will continue to be limited to a maximum of 10. This limit does not include Departmental management vehicles which will be kept to a minimum. The impact of the vehicles on the island will be monitored and reviewed on a regular basis and if negative environmental impacts occur (see Section 48 – *Rehabilitation*) then alternative arrangements such as tracking vehicles electronically or a further restriction on the number of vehicles may be considered.

Any development of the freehold lots on Dirk Hartog Island as eco-tourism accommodation will lead to increased numbers of visitors staying overnight on the island. This could result in pressure for increasing vehicle numbers on the island. However, more vehicles are likely to have a negative impact on the track conditions and potentially affect the ecological restoration project (see Section 21 – *Native Animals*). The limit of 10 private vehicles per day on the island has been set but will be monitored to determine if the upper limit for vehicle numbers can be changed. The implementation of an island-based vehicle hire system may also be considered. Other strategies may be required to consider visitor access around the island.

The barge access is unlikely to change and is an effective means of monitoring visitors and keeping the number of vehicles low. The tracks on the island are narrow and only accessible by four-wheel drive. For safety reasons, pull-over bays may be constructed along the main north-south track to allow safe passing of vehicles. In summer the tracks become powdery, difficult to traverse and more prone to degradation. Therefore the island may need to be closed to public vehicle access during summer months which has occurred to date. Upgrading of the tracks is also difficult due to a lack of available basic raw materials and would compromise the vision of the island as providing a visitor experience in a remote and natural environment.

Many of the access tracks across Dirk Hartog Island previously used for pastoral purposes will be closed to the public. Access to the many coastal sites will continue to be provided (see Map 8). The ‘Mystery Loop’ recreational drive connecting Sandy Point, Cape Inscription and Quoin Head is proposed in the northern part of the island (see Map 8). Other scenic driving routes may be provided over time as resources are made available.

All public access tracks on the island will be sign-posted according the Departmental standards, guidelines and World Heritage Property Style Guide recommendations.

There is the potential for visitors to the island to bring animals such as cats, foxes or rats onto the island which would have a severe impact on threatened fauna populations. The current informal ‘permit’ system will be formalised as a means of continuing to limit vehicle numbers, protecting the natural values, ensuring pets are not brought onto the island, promoting a code of ethics for four-wheel drivers, and informing visitors on appropriate behaviour whilst enjoying the island. A hygiene management plan will be required in the future to prevent the introduction of pests and diseases.

All terrain vehicles (ATVs) may be used by the Department for management purposes on the island to further limit vehicle impacts. However, visitors will not be permitted to bring ATVs or motorbikes to the island due to safety and issues with managing off-road use.

Boat Access

Boat access to Dirk Hartog Island is likely to increase once it becomes managed by the Department. A significant threat to the island’s natural values is from visitors bringing animals ashore, particularly introduced predators and herbivores such as cats, rabbits, foxes, rats or insects such as cockroaches. Introduced predators

can have a severe impact on threatened fauna populations. Boat access may be controlled by applying a permit system as a means for ensuring pets are not introduced, preventing campsites from becoming degraded, informing visitors on appropriate behaviour, monitoring numbers and types of visitors and protecting the beach environment.

Air Access

There are two airstrips on Dirk Hartog Island and a helipad has been constructed at Cape Inscription adjacent to the lighthouse.

The Department will have a requirement for an airstrip on Dirk Hartog Island National Park. There are two basic airstrips on the island, one near the homestead and the other near Sunday Island Bay. In addition, the construction of an airstrip at Cape Inscription near the lighthouse has been proposed. Under the terms of the agreement to purchase Dirk Hartog Island station between the State of Western Australia and the pastoral lease holder, a non-exclusive licence to access and use an airstrip on the island is to be provided.

More general information relating to air access and criteria for the construction and maintenance of airstrip in the planning area is described in Section 32 – *Visitor Access – Air Access*.

Special Access

Access to Dirk Hartog Island National Park is seasonal, difficult and costly because of the barge access and limits of vehicle numbers. Limited numbers will be retained by limiting private and tour operator vehicles initially to a maximum of 10, until benchmarks can be established to monitor any environmental degradation caused by vehicles. This will also ensure a measure of control on vehicle and visitor numbers and a means of limiting environmental damage to tracks, especially in the summer months.

Seasonal or permanent restrictions on access to some parts of the island under section 62 of the CALM Act may need to be introduced where turtle nesting and bird breeding or roosting colonies are particularly sensitive to disturbance or for cultural reasons. Access to the beach north of Cape Levillain where turtle nesting is known to occur (including Turtle Bay) will not be permitted during nesting season from November to March. Access to the beach area south of Cape Levillain during turtle nesting will be permitted. The *Perseverant* shipwreck survivor's camp is a protected site under the Maritime Archaeology Act and access to this site will be restricted.

The commencement of the ecological restoration project and especially the reintroduction of threatened native fauna will require access restrictions for both vehicles and boats. Therefore access to Dirk Hartog Island National Park will be by permit. A permit system will be used to control where visitors can travel, provide valuable visitor information, allow limits to be placed on the number of vehicles, outline appropriate behaviour and provide a means for informing visitors on how they can best avoid disturbing the site whilst visiting the area. Eventually, hygiene control may need to be implemented to prevent the entry of pests and diseases.

44.1 – Dirk Hartog Island – Access

Key Points

- Access to Dirk Hartog Island National Park is currently by barge and four-wheel drive only.
- The sandy tracks of Dirk Hartog Island National Park cannot sustain intense use by large numbers of vehicles and becomes eroded and corrugated when use is high.
- Basic raw materials for road maintenance and building are in very limited supply.
- Aircraft may access the planning area but seasonal airstrips on Dirk Hartog Island National Park limit the areas that may be utilised.
- Boat access to the island is likely to increase over the life of the plan and impacts from boat visitors will need to be carefully managed (see Section 44.2 – *Dirk Hartog Island – Recreation Use and Activities – Overnight Stays*).

The objective is to provide a range of access types on Dirk Hartog Island that do not adversely impact on the key values of the planning area or visitor appreciation of these values and minimises conflict with other users.

This will be achieved by:

1. developing access on Dirk Hartog Island National Park according to Table 18, Map 8 and strategies

outlined in Section 32 – *Visitor Access*;
2. authorising access by permit to Dirk Hartog Island National Park and other areas with safety, cultural or specific natural values needing protection such as turtle nesting and bird breeding sites;
3. initially limiting the maximum number of private vehicles on Dirk Hartog Island National Park to 10 per day, including tour operator and service vehicles but excluding departmental management vehicles, in order to protect the natural values of the island and limit environmental damage to tracks;
4. monitoring the effects of the limited number of vehicles on the Dirk Hartog Island and reviewing limits as required;
5. not permitting private ATVs and motorbikes on Dirk Hartog Island National Park;
6. not permitting visitor access to the beach north and west but allowing access south of Cape Levillain when turtle nesting occurs (including Turtle Bay) between November and March;
7. designating some parts of Dirk Hartog Island National Park for boat access only; and
8. supporting the provision of helipads and airstrip(s) on Dirk Hartog Island National Park after assessment against appropriate criteria (see Section 32 – *Access*).

44.2 Recreation Use and Activities

Wildlife Encounters

Turtles are known to nest in the Turtle Bay-Cape Levillain area on Dirk Hartog Island. Monitoring the numbers and biology of turtles at Turtle Bay has occurred for several years. The impacts of visitors on nesting turtles can be difficult to manage as laying sites vary from year to year. Adverse effects can be minimised through education, restricting vehicle or boat access on beaches, and the appropriate siting and design of facilities.

The lessees of the proposed Cape Levillain eco-camp must comply with the criteria outlined in the Agreement between the State Government of Western Australia and Hypermarket Pty. Ltd. in relation to Dirk Hartog Island. To minimise impacts on the turtles and turtle nesting sites and to generally protect the environment, the lessee must:

i) ensure that the development and any improvements are set back from the boundary of the lease, so that no artificial light emitted from the lease is directly or indirectly visible from any turtle nesting beach or one nautical mile out to sea from any beach or site;
ii) ensure any structures on the lease are designed with a minimum use of outdoor light;
iii) ensure all outdoor lights are sensor operated and have covers to deflect light downwards, to prevent light being directed into the sky;
iv) ensure that all toilet facilities in the lease are self contained with no leaching of nutrients to the external environment; and
v) ensure all information is given to the lessee about appropriate access and activities on turtle nesting beaches to avoid impact on turtle breeding activities as required by the CEO of the department and shall observe all instructions in relation to protection of nesting turtles and rookeries.

Any eco-camp development proposals will also require site development plans and an environmental management plan.

Public access to the beach at Turtle Bay during turtle nesting season will not be permitted. For turtle interactions outside this area, such as south of Cape Levillain point, turtle interaction protocols previously established for the Cape Range-Ningaloo area, such as tour operator accreditation, may be required (CALM 2005c).

44.2 – Dirk Hartog Island – Recreation Use and Activities – Wildlife Encounters

Key Points
- Turtle Bay is an important turtle nesting site and impacts from visitors need to be minimised.

The objective is to provide opportunities for sustainable wildlife encounters on Dirk Hartog Island that facilitate visitor enjoyment, appreciation and understanding.

This will be achieved by:
1. continuing to monitor turtle populations at Turtle Bay (see Section 21 – *Native Animals*);
2. ensuring that any eco-camp development on leasehold land at Cape Levillain and access to turtle

breeding beaches in the area comply with the criteria outlined above;
3. in other areas, requiring that any turtle interaction to abide by turtle interaction protocols previously established for the Cape Range-Ningaloo area, including tour operators accreditation; and
4. monitoring the operations of any eco-camp development on leasehold land at Cape Levillain and access to turtle-breeding beaches to ensure that turtles are not impacted.

Scenic and Recreational Driving

One specific recreational drive trail is proposed for Dirk Hartog Island National Park, the Mystery Beach Circuit, a circuit track north from Sandy Point to Cape Inscription, south to Quoin Head then returning east to Sandy Point.

44.2 – Dirk Hartog Island – Recreation Use and Activities – Scenic and Recreational Driving

Key Points
- Visitors to Dirk Hartog Island seek opportunities for both scenic and recreational driving.

The objective is to provide opportunities for scenic and recreational driving on Dirk Hartog Island that does not cause damage the environment, is safe and minimises conflict with other users.

This will be achieved by:
1. developing recreational driving circuits on Dirk Hartog Island National Park;
2. developing and promoting a code of conduct for driving on Dirk Hartog Island National Park with consideration for issues such as tyre pressure, appropriate speeds and the size and type of vehicles; and
3. maintaining a marked track across the sand dunes on Dirk Hartog Island National Park and informing drivers that leaving the marked route is not permitted.

Overnight Stays

Built Accommodation

Three huts have been constructed on Dirk Hartog Island National Park at Withnell Point, West Point and Urchin Point. They are popular with fishers who visit the island offering shelter and protection from the weather, especially the strong southerly winds. They are of varying styles and standards, are unlikely to meet building codes and the level of services provided, such as toilets, are not adequate. Establishment and use of these huts has resulted in vegetation clearing, the introduction of weeds and other disturbances to the native vegetation. The upgrading, replacement or removal of the existing huts on Dirk Hartog Island National Park requires consideration in the development of a recreation master plan for the island. Similar shelters or huts of a suitable standard may be constructed at other sites on Dirk Hartog Island.

Other buildings on Dirk Hartog Island may be made available for staying overnight. The old lighthouse keepers' quarters at Cape Inscription is being restored by the Shire of Shark Bay and may provide future accommodation opportunities.

As part of the Government's agreement to establish Dirk Hartog Island National Park, three freehold titled areas have been created and are to be developed for ecotourism purposes, two at Sunday Island Bay (13 ha and 4.5 ha) and one adjoining the homestead block (17.3 ha). The existing homestead lot (40.4 ha) will remain as freehold. Under the terms of the agreement, the size of each unit at the homestead adjacent lot and Sunday Island lots can be a maximum of 90 square metres and the total number of units in each area is to be 103 and 95 respectively. The maximum size of units on the existing homestead freehold lot can be 200 square metres and a total of 212 units can be constructed. This proposal could potentially result in between 1600 and 2500 people staying overnight in these areas. In addition a small lease area at Cape Levillain (2.5 ha) is to be established and developed to provide some form of low impact, nature-based accommodation.

The impact of any increases in available built accommodation on the natural values of the island, the proposed ecological restoration project in particular (see Section 21 – *Native Animals*), the proposed management settings

and the cultural environment is difficult to determine but is potentially significant and will need to be carefully monitored and evaluated when any development proposals are prepared.

Camping

Four-wheel drive accessible campsites, some with facilities, exist on Dirk Hartog Island National Park (see Map 8 and Table 19).

People planning to visit Dirk Hartog Island National Park are currently required to pre-book their visit to ensure security of one of the limited number of sites and to make arrangements to transport vehicles to the island. This booking arrangement will remain in place and eventually may be expanded to all campsites across the planning area.

In Dirk Hartog Island National Park there are a limited number of sites where informal camping occurs with four sites having huts. Camping at the informal sites will continue with some identified to have improved facilities. Other sites on the island may be developed as needed but visitor numbers will be kept at low levels. Camping on the beach north of Cape Levillain, including Turtle Bay, when turtle nesting occurs between November and March will not be permitted. Herald Bay will also be closed for camping.

Several parts of the planning area are suitable for the development of campsites for boat access only. Specific sites along the eastern coastline of Dirk Hartog Island National Park could be developed as boat access only camping destinations which would provide a unique opportunity for people visiting the area. However, there is limited knowledge of the extent and frequency of boat access camping and surveys will need to be conducted before any specific campsites can be developed.

Table 19: Existing and Proposed Overnight Stays on Dirk Hartog Island National Park

Sites	Management Setting	Access	Comment
Existing sites			
South-east area (several sites)	Natural	Boat	Minor sized campsite
Notch Point	Natural-Recreation	4WD vehicle, boat	Minor sized campsite
Louisa Bay	Natural-Recreation	4WD vehicle, boat	Minor sized campsite
Withnell Point	Natural-Recreation	4WD vehicle, boat	Medium sized campsite
Cape Levillain Bay	Natural-Recreation	4WD vehicle, boat	Minor sized campsite
Urchin Point	Natural-Recreation	4WD vehicle	Medium sized campsite
West Point	Natural-Recreation	4WD vehicle	Medium sized campsite
Mystery Beach	Natural-Recreation	4WD vehicle	Minor sized campsite
Quoin Head	Natural-Recreation	4WD vehicle	Minor sized campsite
Existing sites that will be closed, moved or upgraded			
Notch Point	Natural-Recreation	4WD vehicle, boat	Medium sized campsite
Herald Bay (DHI)	Natural-Recreation	4WD vehicle, boat	Closed to camping
Louisa Bay	Natural-Recreation	4WD vehicle, boat	Medium sized campsite
Cape Levillain Bay	Natural-Recreation	4WD vehicle, boat	Moved off beach
Proposed new sites			
Ransonnet area (DHI)	Natural-Recreation	4WD vehicle	Minor sized campsite

44.2 – Dirk Hartog Island – Recreation Use and Activities – Overnight Stays

Key Points

- The development of eco-accommodation and the freehold lots is likely to have environmental impacts on the island and these will be assessed once development proposals have been prepared.
- Basic shelter accommodation is provided at Withnell Point, West Point and Urchin Point.
- There are a number of existing camping sites of varying quality on Dirk Hartog Island National Park.

The objective is to provide opportunities for visitors to stay overnight on Dirk Hartog Island in appropriately designed built accommodation and campsites, that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising

environmental impacts.

This will be achieved by:

1. providing opportunities for a range of built accommodation that is consistent with the appropriate visitor management setting and as resources permit (see Table 19 and Map 8);
2. assessing the condition of the huts on Dirk Hartog Island National Park using a range of criteria including structural integrity, safety and visual impacts, and considering upgrading, replacing, relocating or removing;
3. maintaining vehicle-based camping at existing low levels on Dirk Hartog Island National Park; and
4. conducting surveys to determine the demand for boat-based camping on Dirk Hartog Island National Park and developing boat-based camp sites on the basis of these.

Day-Use

Creation of the proposed national park and the proposed development of eco-tourism accommodation with the freehold lots on Dirk Hartog Island, will increase demand for the development of day-use sites on the island over the life of this plan.

Cape Inscription will remain one of the key visitor attractions on the island requiring suitable day use facilities and services.

Existing and proposed day-use sites on Dirk Hartog Island National Park are shown in Table 20 and Map 8.

Table 20: Existing and Proposed Day Use Sites on Dirk Hartog Island National Park

Site	Management Setting	Primary activities (existing and proposed)	Comment
Existing Sites			
Dampier Memorial/ Perseverant	Natural-Recreation	Interpretation	To be developed as interpretive site.
Cape Inscription	Natural-Recreation	Sightseeing, interpretation	Currently used for day-use.
Proposed Sites			
Cape Ransonnet	Natural-Recreation	Interpretation	To be developed as minor interpretive site.
Surf Point	Natural-Recreation	Sightseeing, interpretation	To be developed as minor interpretive site.
Blowholes (DHI)	Natural-Recreation	Lookout, sightseeing	To be developed as minor interpretive site.
Zuytdorp Cliff Lookout	Natural-Recreation	Lookout, sightseeing	To be developed as minor interpretive site.
Notch Point [1]	Natural-Recreation	Sightseeing, interpretation, fishing	To be developed as minor interpretive site.
Quoin Bluff South	Natural-Recreation	Sightseeing, interpretation	To be developed as medium cultural interpretive site.
Herald Bay	Natural-Recreation	Sightseeing, interpretation	To be developed as minor cultural interpretive site.
Turtle Bay Lookout	Natural-Recreation	Lookout, sightseeing	To be developed as minor interpretive site with walks.
Cape Inscription	Natural-Recreation	Sightseeing, interpretation	To be developed as major cultural interpretive site with walks.
Charlies Harbour/ Quoin Head	Natural-Recreation	Sightseeing, fishing	To be developed as minor day use site.
Mystery Beach [1]	Natural-Recreation	Sightseeing, fishing	To be developed as minor day use site.

1. Sites listed are those that will have facilities.

44.2 – Dirk Hartog Island – Recreation Use and Activities – Day-Use

Key Points

- Day-use currently occurs at the Dampier Memorial site on Dirk Hartog Island National Park.

The objective is to provide opportunities for visitors to visit sites on Dirk Hartog Island during the day in appropriately designed sites, which facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of day use opportunities consistent with the appropriate visitor management setting and as resources permit (see Table 20 and Map 8).

Bushwalking

A summary of the existing and proposed walks in Dirk Hartog Island National Park and their class is provided in Table 21 and Map 8. Longer day or overnight walking may be undertaken along unmarked tracks. Visitors intending to undertake such walks must advise the District office. Other bushwalks may be developed as demand increases and after detailed planning, review of the management setting implications and public consultation.

There are visitor risk issues along the rocky cliffs on the west coast of Dirk Hartog Island National Park. There are several opportunities for short walks on the island to feature the cultural heritage including locations such as Cape Inscription, Turtle Bay, Cape Levillain, Notch Point and Quoin Bluff South. Other short walks to view natural features may be developed over time.

Table 21: Walk Trails on Dirk Hartog Island National Park

Walk	Management Setting	Proposed Class (1-6)	Comment
Proposed			
Cape Inscription Heritage Walk	Natural-Recreation	2	Precinct walk
Cape Inscription to Turtle Bay	Natural-Recreation	3	To interpret explorations
Quoin Bluff South Heritage Walk	Natural-Recreation	3	Cultural interpretive walk

44.2 – Dirk Hartog Island – Recreation Use and Activities – Bushwalking

Key Points

- There are many opportunities to provide short walks in Dirk Hartog Island National Park.

The objective is to provide opportunities for a range of bushwalks on Dirk Hartog Island that are developed to an appropriate class, are safe, facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. providing a range of bushwalking opportunities consistent with the criteria for each class of track and the appropriate visitor management setting (see Table 21).

Recreational Boating

Shark Bay offers great potential for sea kayaking in the many sheltered bays and lagoons. Sea kayaking in the sheltered bays of Dirk Hartog Island is likely to become a popular activity. Specific campsites may need to be developed to facilitate sea kayaking. Guidelines and information for sea kayaking will be developed. The guidelines could include party size, safety, minimal impact camping, wildlife interaction and identify restricted sites because of high natural values.

44.2 – Dirk Hartog Island – Recreation Use and Activities – Recreational Boating

Key Points

- Sea kayaking in the sheltered bays of the east coast of Dirk Hartog Island National Park is likely to become a popular activity.

The objective is to provide opportunities for recreational boating adjacent to Dirk Hartog Island that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.

This will be achieved by:

1. developing sea kayak trails around the east coast of Dirk Hartog Island National Park as required.

Water-based Activities

The Shark Bay Marine Park offers a variety of diving opportunities and marine habitats to explore. In particular, there are reefs and shallow, sheltered bays on the east coast of Dirk Hartog Island National Park that are safe and popular for novice divers and snorkellers. A number of these sites are accessible from the shore. Diving and snorkelling activities can help to promote public awareness and understanding of the marine environment. Providing information and interpretation can enhance this experience and highlight safety issues such as the presence of strong currents and potentially dangerous marine animals. Some specific sites on the east coast of Dirk Hartog Island National Park may be developed and promoted as diving and snorkelling destinations.

More general information relating to water-based activities in the planning area is described in Section 33.8 – *Recreation Activities and Use – Water-based Activities*.

44.3 Tourism and Commercial Operations

Private tourism developments exist and others are likely to be proposed for Dirk Hartog Island. It is important that, such tourism developments do not adversely impact on World Heritage and other key values and this will be monitored through the approvals process. Dirk Hartog Island currently provides tourist accommodation and services at the homestead. The eco-tourism development at the homestead and the proposed eco-tourism development within the freehold lots at Sunday Island Bay and area adjacent to the homestead is likely to result in an increased level of commercial tourism on the island.

There is also interest for an eco-tourism development located in the vicinity of Cape Levillain, in part of the Dirk Hartog Island National Park. This lease area was established as part of the agreement between the pastoral lease holder and the Government to purchase Dirk Hartog Island. The lease will be established under section 100 of the CALM Act.

Fees are associated with all commercial tourist activities conducted on lands or waters managed by the Department. Tour operators using parts of Dirk Hartog Island National Park will require a licence to operate.

More general information relating to tourism and commercial operations in the planning area is described in Section 34 – *Tourism and Commercial Operations*.

44.4 Visitor Safety

Rock fishing along the west coast of Dirk Hartog Island National Park can be a dangerous activity and has resulted in a number of serious injuries. The Department is currently investigating the practicalities of providing a range of devices to address this risk such as buoyancy devices and fixed tie off points and, in consultation with fishers, these will be considered for parts of the planning area.

44.4 – Dirk Hartog Island – Visitor Safety

Key Points

- The proposed national park has not been formerly assessed for visitor risk and in particular the limestone cliffs along the west coast of Dirk Hartog Island National Park are potentially high risk areas.

The objective is to minimise risks to the public who visit Dirk Hartog Island while maintaining a range of visitor experiences.

This will be achieved by:

1. adopting codes of safe conduct for popular activities (such as four-wheel driving, hiking, swimming, fishing, sea kayaking and surfing) and promoting and publicising them as appropriate.

44.5 Domestic Animals

Dogs are currently not permitted on Dirk Hartog Island National Park and this will continue during the life of the plan.

44.5 – Dirk Hartog Island – Domestic Animals

Key Points

- Dogs are not permitted on Dirk Hartog Island National Park.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:

1. not permitting domestic animals in Dirk Hartog Island National Park, with the exception of guide dogs and dogs associated with search and rescue operations (see Section 24 – *Introduced and Other Problem Animals*).

PART F. MANAGING RESOURCE USE

Various Departmental policy statements provide management directions for managing resources sustainably including:

- Policy Statement No. 10 – *Rehabilitation of disturbed land* (CALM 1986a);
- Policy Statement No. 54 – *Defence force training on CALM managed lands and water*s (CALM 1996a);
- Policy Statement No. 51 – *Access for commercial fishing through CALM Lands* (CALM 1993); and
- the Conservation Commission Policy Statement No. 3 – *Basic raw materials: government and local government access to conservation estate (national parks, nature reserves and conservation parks)*, Conservation Commission of Western Australia, Perth.

Sustainability is an aspirational goal of "meeting the needs of current and future generations through an integration of environmental, social advancement and economic prosperity" (WA Government 2003b). Using natural resources to provide economic and social benefit usually requires the determination of sustainable yield or allocation limits to ensure the natural resources are not consumed beyond acceptable means (WA Government 2006). Using the natural resources of the Shark Bay area sustainably is critical to the long term management, conservation and protection of such resources.

45. TRADITIONAL HUNTING AND GATHERING

The hunting and gathering of food by Malgana and Nanda is an important part of their culture, enabling them to maintain traditional relationships with the land and water, share knowledge and partake in traditional practices. Malgana and Nanda in the region accessed the lands and waters of Shark Bay for a range of food that included various plants, mammals, fish, birds, reptiles, frogs and invertebrates.

Use of flora and fauna by Aboriginal people is provided for under section 23 of the Wildlife Conservation Act. Flora and fauna can be taken by Aboriginal people for food for consumption with the prior consent of the occupier of the land (Chief Executive Officer of the Department). Aboriginal people may take flora and fauna for food from all land (including waters) except in a nature reserve or wildlife sanctuary. Conditions associated with approval include:

- that the use of wildlife does not result in a overall decline in the population;
- food is only taken by a cultural group associated with the planning area;
- special provisions for the taking of some species (e.g. specially protected species);
- the activity does not impinge upon the safety of others;
- the food taken is not sold; and
- the activity is consistent with other land management objectives.

The only exception to this is the dugong. Dugong may be taken (the definition of 'take' includes to kill or capture, disturb or molest) under certain circumstances and for certain purposes in Western Australia. A "person of Aboriginal descent" (as defined in Section 4 of the *Aboriginal Affairs Planning Authority Act 1972*) may take dugong sufficient only for food for himself and his family. Dugong may not be sold, given to persons outside the hunter's family or taken from a Marine Park, Marine Nature Reserve or Marine Protected Area without a licence issued under the Wildlife Conservation Act.

In addition, before flora and fauna are taken for food, permission from the Malgana and Nanda, who can speak for the country, should be obtained.

General provisions of the CALM Act and Wildlife Conservation Act apply to other Aboriginal activities. For instance firearms may not be carried on a reserve, existing access tracks to be used and visitor safety is paramount.

Over the life of this plan the native title rights of Aboriginal people may change, including those relating to hunting and gathering. The Department will ensure conformity with any changes to legislation or Government policy during the life of the plan.

45 – Traditional Hunting and Gathering

Key Points:
- As part of their culture, Malgana and Nanda may hunt or gather from within the planning area apart from nature reserves or wildlife sanctuaries.
- The Wildlife Conservation Act allows customary activities to occur provided certain conditions are in place.
- It is possible that legislation and Government policy in relation to traditional hunting and gathering may change during the life of this plan.

The objective is to provide the traditional custodians with an opportunity to maintain their social, economic and cultural practices, while ensuring the protection of the key values of the planning area.

This will be achieved by:
1. allowing Aboriginal people to hunt and gather in the planning area, provided:
   - they are from a cultural group associated with the planning area or have permission from Malgana and Nanda people who can speak for the country;
   - have authorisation from the Department's Chief Executive Officer; and
   - safety and sustainable resource use issues have been addressed.
2. ensuring that management adapts to and conforms to any legislative or policy changes during the life of this plan.

Key Performance Indicators:
There is no Key Performance Indicators for this section.

46. MINERAL AND PETROLEUM EXPLORATION AND DEVELOPMENT

Mining in Shark Bay currently focuses on basic raw material extraction, shell and coquina mining and salt production. Salt is the most significant mineral produced in Shark Bay, with an annual average of 1.3 million tonnes of salt produced at Useless Loop. In the past, petroleum exploration licences have been issued for the waters between Bernier and Dorre Islands and the Carnarvon coast but no exploration has actually occurred.

Legislative Framework

Mining[13] on land and waters managed by the Department is subject to the Mining Act, the Petroleum and Geothermal Energy Resources Act, the Petroleum Pipelines Act and Petroleum (Submerged Lands) Act, the Environmental Protection Act, the Wildlife Conservation Act and various State Agreement Acts. Agreements between developers and the State are generally enacted for major resource projects that require large capital investments and significant infrastructure and the *Shark Bay Solar Salt Industry Agreement Act 1983* applies in the Shark Bay area. The Environmental Protection Act takes precedence over most other acts. The Commonwealth EPBC Act needs to be considered for any mineral and petroleum exploration and development proposal for protection of nationally threatened species, World Heritage values and National Heritage values.

Mining projects that potentially may cause significant environmental impacts can be referred to the Environmental Protection Authority (EPA) under section 38 of the Environmental Protection Act by the proponent, the DMP, the Conservation Commission, the Department and individuals. The Conservation Commission provides advice to the Minister for Environment with regards to all mining tenement applications for all reserves.

Management of the terrestrial reserves in the Shark Bay World Heritage Property requires that Australia meet its obligations under the World Heritage Convention to protect, conserve, present and transmit to future generations the World Heritage values for which the Property was inscribed on the World Heritage List. The Property is of National Environmental Significance under the Commonwealth EPBC Act and mining in and adjacent to the Property is subject to the EPBC Act and the terms and conditions stated in the 1997 State-Commonwealth Agreement on administrative arrangement for the Property.

[13] Mining includes exploration, fossicking, prospecting and mining operations.

A proposal that has, will have or is likely to have a significant impact on World Heritage values of a declared World Heritage Property will be referred to the relevant Commonwealth Minister responsible for the EPBC Act for approval. Mining proposals may be referred to the relevant Commonwealth Minister responsible for the EPBC Act by either a Commonwealth or State agency, or by the proponent. Assessment of proposals may be carried out by the relevant Commonwealth Government agency or can be delegated to the 'Designated Authority' under bilateral agreements, where the State assessment processes are accredited to perform this function on the behalf of the relevant Commonwealth agency. Similarly, assessment may be carried out by a Commonwealth agency accredited to perform this function under a Ministerial declaration. During the assessment process, the Conservation Commission and the Department have the opportunity to comment on the impact of proposals.

The Environmental Protection Act provides for the protection of native vegetation and control of clearing. Any clearing of native vegetation will require a permit under Part V of the Act except where exemptions are granted under Schedule 6 of the Act or prescribed by regulation in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. For the mineral and petroleum industries, applications for any clearing associated with their exploration, production or development activities will require a permit in all cases except where granted an exemption.

The document, *Guidelines for Mineral Exploration and Mining within Conservation Reserves and other Environmentally Sensitive Areas* (DME 1998), outlines the procedures and conditions to be applied to applications for mining tenements. Under a 2004 MOU between DMP and the EPA, all development type mining proposals within 2 kilometres of a national park, marine park, State forest or proposed conservation reserve will be automatically referred to the EPA for assessment.

In 2006 the EPA released Position Statement No. 9 *Environmental Offsets* (EPA 2006). Should mining or petroleum tenements be approved in proposed conservation estate, these should be subject to the principle of environmental offsets. In addition, there is an expectation under the Mining Act that areas disturbed by mining should be rehabilitated and it is the Department's position that the costs of rehabilitating mining and petroleum activities should be borne by the organisation(s) responsible for the activity.

Government Policy

The exploration for and subsequent development of minerals in Western Australia is primarily administered by the DMP through the granting of various tenements including prospecting licences, exploration licences, general purpose leases and mining leases. DMP also administers the exploration for and subsequent extraction of petroleum resources through the granting of exploration permits and production licences. The holders of such tenements, permits and licenses are required to meet conditions to retain the right to explore and develop.

Across the State, the granting of a mining lease (or general purpose lease associated with mining operations) within a national park or class A nature reserve requires the concurrence of the Minister for Environment and concurrence of both Houses of Parliament. Where given, Parliamentary approval may involve the imposition of conditions.

Outside the South West Land Division, the granting of a mining and petroleum tenement in class A conservation parks and section 5(1)(g) / 5(1)(h) reserve requires that the Minister for Environment be consulted. Similarly, for non class A nature reserves, conservation parks and section 5(1)(g) / 5(1)(h) reserves, the Minister for Environment needs to be consulted.

For Department-managed former pastoral leases, the Department and Conservation Commission are of the opinion that mining or petroleum proposals should be treated as if these areas already had the proposed tenure (e.g. national park, conservation park, nature reserve). Consequently, the Department requires that appropriate conditions are applied and is consulted by DMP whenever mineral exploration or development activities are proposed on these leases.

Should mining or petroleum tenements be approved in proposed conservation estate, these should be subject to the principle of environmental offsets. In addition, the Department's position is that the costs of rehabilitating mining and petroleum activities should be borne by the organisation(s) responsible for the activity.

World Heritage listing does not prevent mineral exploration and development but these are carefully evaluated under the Environmental Protection Act and only allowed to proceed if they can be implemented in a way which does not compromise the values for which the area was listed. The EPA has developed *Guidance Statement for*

Assessment of Development Proposals in Shark Bay World Heritage Property No. 49 (EPA 2000) to assist in developing and for assessing potential environmental impacts of proposed developments. As part of this process, the World Heritage Community Consultative and Scientific Advisory Committees are requested to comment.

For existing commercial activities including mining, the 1997 State-Commonwealth Agreement (CALM & EA 1997) provides for their continuation as long as they complied with existing controls and are not a threat to the World Heritage values or the overall integrity of the Property. On this basis, existing operations have been allowed to continue, subject to compliance with relevant conditions and ongoing monitoring. Any future proposal to conduct exploration activities within the planning area will be viewed in accordance with the assessment process set out in the 1997 State-Commonwealth Agreement (CALM & EA 1997) and relevant State and Commonwealth legislation and policies, and will be subject to assessment that it may be undertaken in a manner that is consistent with the protection of World Heritage and other key values.

The Petroleum and Geothermal Energy Resources Act requires that no petroleum exploration or development activity will be approved within reserves vested in the Conservation Commission until the Minister responsible for this Act obtains the recommendations of the Minister for Environment. A protocol has been established between DMP and the Department to facilitate processing of applications for petroleum titles when the proposed activities are located within the State's conservation estate or World Heritage Properties. The policy to be applied in relation to petroleum resource exploration and development in the Shark Bay World Heritage Property was reviewed by the EPA and a section 16(e) report produced in October 2003. In summary, the report states that petroleum exploration and extraction in the Property is incompatible with the maintenance of natural, cultural and world heritage values. However, the report notes three scenarios where some development might be considered. Any proposed petroleum activity within the World Heritage Property will need to be referred to both the State EPA and the relevant Commonwealth Government agency for assessment under the EPBC Act.

Following commencement of the amendment legislation to the Petroleum and Geothermal Energy Resources Act, the former DoIR completed a release of exploration acreage for geothermal energy resources. The new DMP is now assessing applications for exploration permits for geothermal energy. A second release of geothermal energy exploration acreage is planned on the lands adjacent to the planning area. Subsequent exploration activity will provide increased knowledge of the geothermal energy resource potential of this area.

Mineral & Petroleum Resources and Prospectivity

The most significant mineral development in Shark Bay is the solar salt operation at Useless Loop between Heirisson and Bellefin Prongs (Mineral Lease Special Agreement AM09/260). Salt production has occurred at Useless Loop since 1965. Almost all the salt is sold for export, using about 40 ship loadings per year.

The salt operation is excluded from the World Heritage Property and is managed in accordance with the Shark Bay Solar Salt Industry Agreement Act, an agreement between the State and the SBSJV. The Agreement requires SBSJV to operate in accordance with Commonwealth and State environmental legislation and provides for ongoing environmental investigation, monitoring and reporting. SBSJV has applied for Special Mining Leases 276SA to 280SA, pursuant to Clause 5A of the State Agreement Act, as a necessary legal step in the planned expansion of the existing salt field.

Gypsum mining does not currently occur in the planning area. In the past gypsum has been mined from evaporite pans, known as birridas, at various locations on Carrarang station near Browns Inlet but these tenements are now dead. Mining leases granted in 1984 over unexploited gypsum deposits at the northern end of the Peron Peninsula recently have been relinquished. These leases were enclaves of unallocated Crown land surrounded entirely by Francois Peron National Park when it was established in 1990.

Shell deposits (*Fragum erugatum*) are extracted from a mining lease and a quarry on Shire vested Reserve 41076 adjacent to Shell Beach Conservation Park and Nanga. Extraction from the quarry occurred in the vicinity of the Park from the 1940s to 1989 prior to the Park's gazettal. The shell deposits are used primarily for the production of high quality extender and filler material and also provide granulated shell for the poultry industry, which aids in egg production and hardening of shells. Environmental conditions imposed by the Environmental Protection Authority provide guidelines to ensure that shell extraction is sustainable. Any new expansion proposals would require environmental assessment in accordance with Commonwealth and State legislation. Some research on the biology of this species has been undertaken to determine the potential shell accretion rates for L'haridon Bight.

Coquinite (consolidated *Fragum* shell) is extracted from a quarry reserve near the Hamelin Pool Telegraph Station adjacent to the planning area. This resource is limited, and as such, must be carefully managed. The Shire of Shark Bay manages this area in accordance with the *Hamelin Pool Common Management Plan* (2001). Coquinite has been traditionally used in the construction of buildings, many of which have heritage value. Continued use of the coquinite deposits necessary for the maintenance of these heritage buildings requires strict regulation.

Guano was mined from several islands in Freycinet Estuary from 1850 to 1890. Several islands still have "collection of guano" in their purpose. Guano is no longer collected from these islands.

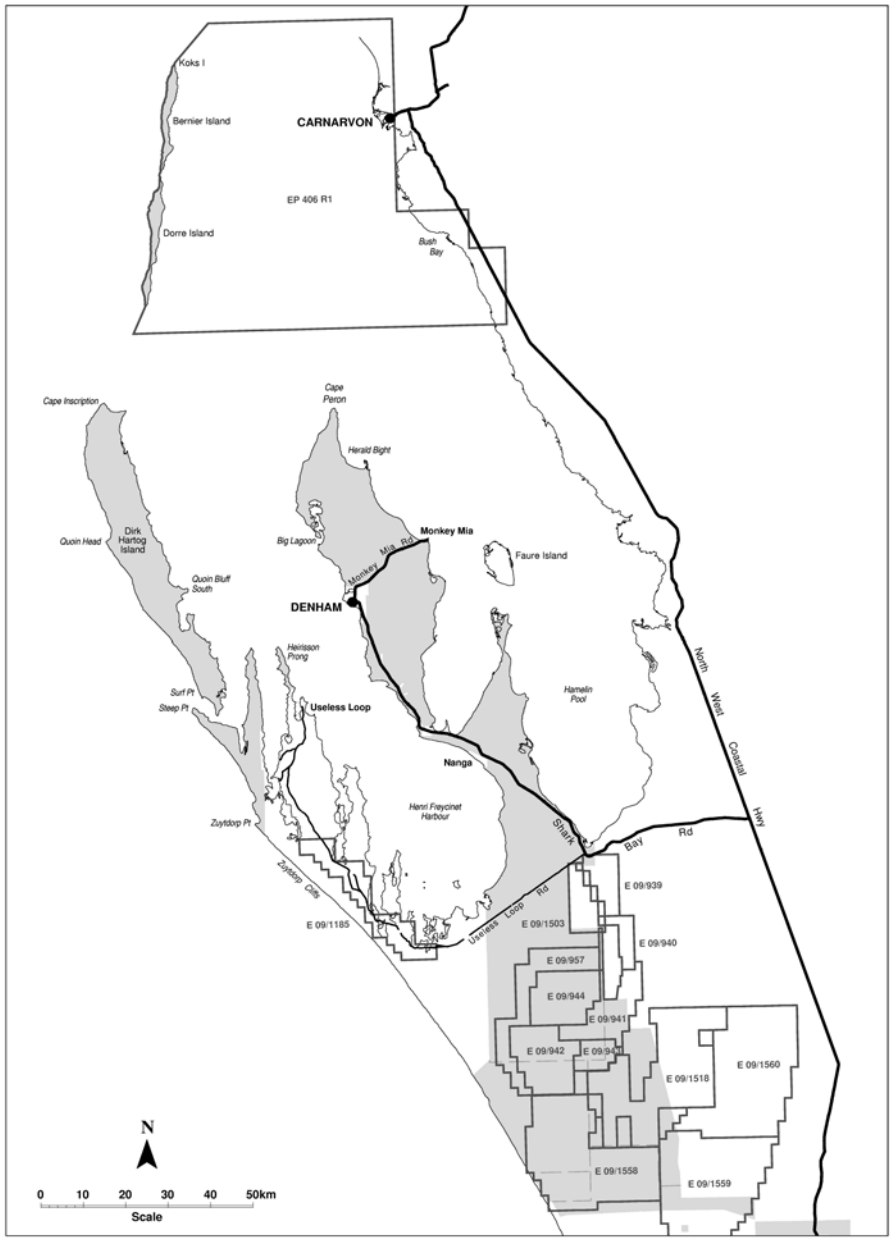


Figure 6: Exploration Licenses of the Shark Bay area

Current exploration activity to assess resources of heavy mineral sands is taking place on exploration licences to the south and east of the southern portion of the planning area (see Figure 6). There are also several granted mining leases in this area that cover the recently discovered Amy Zone of heavy mineral sand deposits. Gunson Resources has been granted three exploration licences on Coburn and Hamelin stations and has one exploration licence application on Hamelin Station. These exploration areas adjoin the World Heritage Property and

planning area. Those areas where an exploration licence extends into the World Heritage Property are currently subject to a 'no-mining (exploration)' condition. 'No mining' conditions are placed on tenements by the responsible agency while access to the reserved portion of land is resolved by the responsible Ministers.

Other exploration licences for mineral sands have been applied for but are pending over existing reserves and proposed reserve additions within the World Heritage Property (see Figure 6).

There have been no active petroleum tenements in the Shark Bay area for over 25 years. During the 1950s, WAPET sank 18 exploration wells on Dirk Hartog Island. One petroleum exploration tenement by Euro Pacific Energy Pty Ltd (Exploration Permit EP 406) expired in 2002. The area of the exploration tenement in the World Heritage Property extended from Bernier and Dorre Islands to the Carnarvon Coast. No field exploration activity had occurred within this tenement. The section 16(e) report completed in 2003 by the EPA stated that petroleum exploration and extraction in the Property is incompatible with the maintenance of natural, cultural and world heritage values but noted three scenarios where some development might be considered.

Table 22 and Figure 6 provide a summary of the mining and petroleum tenements across the Shark Bay area. The information has been sourced from the DMP. The Shire of Shark Bay is responsible for several mining tenements.

Table 22: Current Mining Tenements and Petroleum Titles/Reserves of the Shark Bay Area

Tenement/Title Area*	Lease holder	Lease Status	Lease Area (ha)	Target Resource
State Agreement Act				
AM 70/260	Mitsui Salt	Granted	13,900	Salt
AM70/276	Mitsui Salt	Applied for (14/9/00) & pending	489.4	Salt
AM70/279	Mitsui Salt	Applied for (14/9/00) & pending	999.6	Salt
AM70/280	Mitsui Salt	Applied for (14/9/00) & pending	138.6	Salt
Mining				
M09/68	Todtona P/L	Granted	6.07	Limestone/ limesand
General Purpose				
G09/1	Mitsui Salt	Granted	24.95	Salt
G09/2	Mitsui Salt	Granted	45.4	Salt
G09/3	Todtana P/L	Granted	1.95	Storage of Shell grit
Shire Reserve				
CR41076	Shire of Shark Bay		81.48	Quarry (Shell Grit)
CR44988	Shire of Shark Bay		136.7	Quarry (Rock & gravel)
CR37963	Shire of Shark Bay		4.00	Quarry (coquinite)
Exploration Licence				
E09/939	Gunson Resources P/L	Live	35 blocks	Heavy Mineral Sand
E09/940	Gunson Resources P/L	Live	29 blocks	Heavy Mineral Sand
E09/941	Gunson Resources P/L	Live	61 blocks	Heavy Mineral Sand
E09/942	Stuart Petroleum P/L	Applied for (13/5/98) & pending	70 blocks	Heavy Mineral Sand
E09/943	Stuart Petroleum P/L	Applied for (13/5/98) & pending	22 blocks	Heavy Mineral Sand
E09/944	Stuart Petroleum P/L	Applied for (18/5/98) & pending	63 blocks	Heavy Mineral Sand
E09/957	Stuart Petroleum P/L	Applied for (22/7/98) & pending	70 blocks	Heavy Mineral Sand
E09/1185	Tyson Resources P/L	Applied for (6/12/04) & pending	70 blocks	Heavy Mineral Sand
E09/1503	Gunson Resources P/L	Dead	36 blocks	Heavy Mineral Sand

Tenement/Title Area*	Lease holder	Lease Status	Lease Area (ha)	Target Resource
E09/1518	Diatreme Resources Ltd	Applied for (31/3/08) and pending	189 blocks	Heavy Mineral Sand
E09/1558	Edel Resources P/L	Applied for (27/6/08) and pending	200 blocks	Heavy Mineral Sand
E09/1559	Edel Resources P/L	Applied for (27/6/08) and pending	200 blocks	Heavy Mineral Sand
E09/1560	Edel Resources P/L	Applied for (27/6/08) and pending	199 blocks	Heavy Mineral Sand
Exploration Permit				
EP406 R1	Euro Pacific Energy P/L	Expired 22/11/02, pending renewal	66 blocks	Petroleum

*: M – mining lease, G – General Purpose Lease, E – Exploration Licence, EP – Exploration Permit, AM – Mineral Lease Special Agreement, MC – Mineral Claim, CR – Crown Reserve. Source: Department of Mines and Petroleum, February 2009.

46 – Mineral and Petroleum Exploration and Development

Key Points:

- Applications to mine in the planning area are subject to the Mining Act, the Petroleum and Geothermal Resources Act, the Wildlife Conservation Act, Environmental Protection Act, State Agreement acts, EPBC Act and approval by the relevant Ministers.
- The planning area is subject to both granted and proposed mining and petroleum tenements.
- There are three general purpose, one mining lease, three Shire reserves, three granted and eight applied for exploration permits and a State Agreement Act (salt mining at Useless Loop) across the Shark Bay area with some tenements located within the proposed reserve additions.
- Mineral and petroleum exploration and development within or adjacent to the planning area can have a significant impact on natural, recreation and tourism, cultural and World Heritage values.
- All mining, petroleum and geothermal energy proposals with the potential to impact on the natural, recreation and tourism, cultural and World Heritage values of the planning area should be referred to DMP and then the EPA for their consideration of assessment under the Environmental Protection Act as and when required at the appropriate stage of proposal.
- The exploration and development of renewable hot rock and conventional geothermal energy resources within or adjacent to the management area has the potential to generate base load energy.

The objective is to protect the key values of the planning area through minimising the environmental impacts from mineral and petroleum exploration and development.

This will be achieved by:

1. in conjunction with DMP, evaluating the likely impact of any proposed mineral, petroleum and geothermal energy exploration and development activities within the planning area (and adjacent areas that may impact upon it);
2. in conjunction with DMP, monitoring existing mineral and petroleum exploration and development activities that impact directly or indirectly on the planning area and requesting DMP to take any necessary action where conditions are breached;
3. liaising with mine operators to ensure operations do not impact on natural, recreation and tourism, cultural and World Heritage values;
4. liaising and providing formal advice to the EPA and DMP regarding environmental assessment of proposed mineral, petroleum and geothermal energy exploration and development activities within the planning area (and adjacent areas that may impact upon it);
5. as the lead agency for the 1997 State-Commonwealth Agreement, liaising and providing information to relevant stakeholders (such as the World Heritage Community Consultative and Scientific Advisory Committees) regarding mining proposals;
6. where necessary, referring exploration or mining proposals with the potential to impact upon the planning area to the EPA for their consideration and assessment under the Environmental Protection Act; and
7. seeking compensation and/or additions to lands and waters managed by the Department for losses incurred due to mineral and petroleum exploration and development activities.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

47. BASIC RAW MATERIALS

There is a requirement for basic raw materials (BRM) (i.e. gravel, shale, sand, clay, limestone and rock) in the planning area for road construction and maintenance, residential and commercial development and to a lesser extent recreation site development, maintenance and use for construction. The requirement for gravel supplies in the future may be required from local sources within parks and reserves if alternative off-reserve sources are not available.

The removal of gravel and other raw materials from Department-managed lands in the Shark Bay area is subject to the *State Gravel Supply Strategy* and the Conservation Commission's Policy Statement No. 3 – *Basic raw materials: government and local government access to conservation estate (national parks, nature reserves and conservation parks)* (CCWA 2006). The *Local Government Act 1955* (Local Government Act) is used to give effect to the Conservation Commission Policy. Department procedures have been modified to the extent that a Notice of Entry (NOE) under the Local Government Act is used in lieu of a CALM Act lease to access BRM.

There are no longer large sources of BRM of good quality across the Shark Bay area. However there are many small, shallow deposits scattered in areas adjacent to the roads. Therefore a strategic approach to resource availability and demand is required across the planning area. Extraction of BRM in the planning area for use on roads and facilities managed by the Department within the conservation estate occurs under the CALM Act and approval is given by the Department's Shark Bay District Office. Extraction from reserves in the planning area by Local Government Authorities for use on road reserve enclaves within the conservation estate in the planning area occurs under the Local Government Act and Department approval. Extraction of BRM from reserves in the planning area by private contractors or individuals for use on private easements within conservation estate in the planning area occurs under the Mining Act (CCWA 2006) and approval is required from the Minister for Environment and the Conservation Commission. Extraction of BRM on UCL occurs under the Mining Act.

It is important to note that there is a presumption against accessing BRM in the conservation estate, and that any such application will be assessed on a case by case basis. To minimise disturbance to conservation areas, alternative sources of basic raw materials, located outside the planning area, are preferred. Extraction will be permitted from the planning area where the use of the material assists in the protection and management of the area, a more environmentally acceptable alternative is not available, where the material is used within the reserve boundaries and extraction is consistent with the relevant management plan and purpose, class and tenure of the area (see Section 10 – *Land Tenure and Classification*). Where extraction of basic raw materials does occur, the natural values of the planning area can be maintained by:

- siting pits only in vegetation communities that are adequately represented;
- applying best practice hygiene management; and
- applying best practice rehabilitation following extraction (see Section 48 – *Rehabilitation*).

BRM Prospectivity

BRM, principally gravel, have previously been extracted from the planning area by the Department, Main Roads Western Australia (MRWA), Shire of Shark Bay and private contractors. There are numerous existing basic raw material pits adjacent to existing roads and located in road reserves, UCL or pastoral leases. Over the years, much of the better quality sheeting material close to the roads and easily accessible has been used and many of the extraction sites require rehabilitation. There is a need for inter-agency consultation and a long term strategy to meet the future development and maintenance demands for roads and other developments.

Road construction is the biggest consumer of basic raw materials in the World Heritage Area (Townsend 1996). Materials for road base are usually silty, shelly limestone, silty sand from the margins of birridas, or a mixture of both. Although there is no shortage of road materials, many of the current extraction sites closer to infrastructure are nearly exhausted and transportation costs will increase as these current deposits are exhausted (Townsend 1996). Transport distances of 10-15 kilometres are preferred.

Previously four extraction sites to remove gravel and landfill were located on Monkey Mia Reserve but these have been exhausted and are no longer used. Proposed development plans for Monkey Mia Resort are likely to have significant requirements for BRM which will need to come from outside the planning area.

There are several old and existing reserves in the South Peron area established for gravel extraction adjacent to the Shark Bay Road. Several of the sites located in South Peron are exhausted and require rehabilitation. Currently Shire Reserve No. 44988 on South Peron is used for BRM. Similarly there are several old and

existing areas used for gravel extraction adjacent to the Useless Loop Road. Some BRM sites are exhausted and require rehabilitation. Existing pits, which still contain material, will continue to be used for BRM extraction. Further sites will need to be identified in conjunction with MRWA and Shire of Shark Bay.

Several investigations of potential gravel sources have been undertaken. In 2005 Main Roads recommended several sites along the main access roads to Denham and Useless Loop be further investigated. Most of sites investigated revealed limited and poor quality supplies of sandy limestone base course material and some rubbly salt rock and clay sheeting material adjacent to existing or previously used pits. The pits are shallow which would result in large areas being cleared to obtain a small quantity of material.

The establishment of three quarry reserves have been recommended along the Shark Bay and Monkey Mia roads. Another three areas along the Useless Loop Road have been identified for BRM although at the time of preparing this plan no formal application for reservation has been made. Once exhausted, a rehabilitation plan will be implemented.

In some parts of the planning area such as Dirk Hartog Island National Park and Edel Land there are small limestone quarries that have been used for construction purposes. In some parts of the planning area such as the northern part of Peron Peninsula, Nanga, Edel Land and Dirk Hartog Island National Park, the most suitable material for road construction might be found in the birridas. Birridas have high natural value and development of such areas for BRM can intrude on the landscape. Therefore use of birridas as a source of BRM will only be as a last resort and because there are no alternative sources of material. Use of BRM from the planning area will be subject to standard Department and Government approvals processes.

47 – Basic Raw Materials

Key Points:

- Basic raw materials, particularly gravel, have previously been sourced from within the planning area.
- The development of BRM sites to meet future requirements will need to be strategic and involve liaison with other Government agencies and the Shire of Shark Bay.
- If no alternative BRM sources can be found off-reserve, the Department may take BRM from within a reserve for use on that reserve.

The objective is to protect the key values of the planning area through minimising the environmental impacts from basic raw material extraction and development activities.

This will be achieved by:

1. in accordance with Department and Conservation Commission policies, permitting access to basic raw materials from the planning area where:
   - the use of the material assists in the protection and management of the area;
   - a more environmentally acceptable alternative is not available;
   - the material is used within the boundaries or enclaves of the planning area; and
   - extraction is consistent with this management plan and purpose and tenure of the area.
2. identifying and establishing reserves for the extraction of BRM as other conservation reserves are established;
3. sourcing of BRM by Local Government Authorities and others are to comply with existing Departmental and Conservation Commission policies and guidelines;
4. ensuring that all sites in which mining activity occurs are rehabilitated according to the conditions of the mining lease and Department rehabilitation standards and guidelines – see Section 48 – *Rehabilitation*; and
5. ensuring extraction of BRM and the rehabilitation of these areas are consistent with Department Policy Statement No. 34 – *Visual resource Management of Lands and Waters Managed by CALM* (CALM 1989).

Key Performance Indicators:

There is no Key Performance Indicators for this section.

48. REHABILITATION

Rehabilitation is the establishment of a stable, self-regulating ecosystem following disturbance, consistent with the purpose for which the area is managed. Rehabilitation requirements will vary according to the type and

extent of disturbance to the planning area. Appropriate methods of rehabilitation can minimise environmental impacts and visual amenity. The Department's Policy Statement No. 10 – *Rehabilitation of Disturbed Land* (CALM 1986a) provides guidelines for the rehabilitation of lands managed by the Department, and is based on the following principles:

- land should be managed as far as possible to minimise disturbance;
- rehabilitation should be the last option in a series of management decisions designed to protect natural values (but if disturbance cannot be avoided, then rehabilitation needs to be considered first); and
- rehabilitation should aim to restore original values and help to enhance all potential uses provided the priority uses are not adversely affected.

A proportion of the planning area has been modified by past and present activities including mining and quarrying, clearing of vegetation for agriculture, pastoral grazing, physical damage by vehicles, use of machinery to lay communication cables or build airstrips, visitor activities, the introduction of feral animals and environmental weeds, and mooring activities on beaches. Cyclones and fire also can have significant environmental impacts.

Disturbance is expressed in various ways, including changes to natural assemblages of plants and animals (both terrestrial and marine), changes in ecological processes, soil compaction or erosion, salinisation and reduction in water quality. The introduction of weeds and feral animals can change the natural assemblages, whereas the loss of native fauna can impact on ecological processes.

In cases where other agencies and organisations have been responsible for disturbance within the planning area, it is the Department's policy that the organisation is responsible for rehabilitation of these areas to a suitable standard. In such cases, the cost of rehabilitation should also be borne by the organisation.

Where possible, local native species should be used for rehabilitation purposes to ensure the greatest degree of success, enable new vegetation to blend into the existing environment and limit the introduction of exotic (non-local) plants and disease. Sources of brushing material (branches of trees and shrubs used to stabilise mobile dune systems) should also be free of disease. Rehabilitation in Shark Bay can be difficult because of the variable rainfall and exposure to strong, salt laden winds and can take a long time before the benefits of rehabilitation can be seen.

48 – Rehabilitation

Key Points:

- Rehabilitation can be used following disturbance to natural areas by gravel pit working, mining, road works, track closure, recreation site closure or redevelopment, or activities associated with fire suppression.
- The use of local native species during rehabilitation ensures the greatest degree of success and preserves the biodiversity and landscape values of the area.

The objective is to restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function.

This will be achieved by:

1. ensuring that activities are carried out in accordance with Policy Statement No. 10 – *Rehabilitation of Disturbed Land* (CALM 1986a);
2. managing the planning area, as far as practicable, to avoid disturbance;
3. developing rehabilitation working plans for different parts of the planning area including allocating priorities for works based on:
   - the existing and potential impacts on natural and visual landscape values;
   - the type and extent of the disturbance;
   - the likelihood of natural regeneration;
   - the availability of resources;
   - the level of participation of stakeholders; and
   - the capacity for long-term monitoring.
4. rehabilitating, closing or relocating roads and tracks that have the potential to erode or impact on visual amenity of the planning area;
5. rehabilitating gravel pits in accordance with Department guidelines as outlined in *Guidelines for the*

Management and Rehabilitation of Gravel Pits;
6. ensuring the cost of rehabilitation is borne by those responsible for the disturbance;
7. actively involving private and public groups, individuals and local Aboriginal people in rehabilitation programs;
8. ensuring local plant species are used in rehabilitation schemes wherever possible;
9. educating the public and interested stakeholders on applying best practice rehabilitation techniques; and
10. monitoring, evaluating and recording progress of rehabilitation programs and projects.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
48.1 Changes in the area of rehabilitated land and the number of unnecessary tracks rehabilitated.	48.1 Increase in the area of disturbed land rehabilitated, including rehabilitation of unnecessary tracks.	Every five years.

49. COMMERCIAL FISHING

Legislative Framework and Government Policy

The Department works collaboratively with the Department of Fisheries (DoF) and, in 2005, an MOU was developed which establishes principles of cooperation and integration between the two departments.

Commercial fisheries in the Shark Bay area operate in both State and Commonwealth waters. As such they are subject to both State and Commonwealth legislation and policies as well as international agreements. Adjacent to the terrestrial reserves and proposed reserve additions are the Shark Bay Marine Park and the Hamelin Pool Marine Nature Reserve. There are no Commonwealth marine reserves in the area. Marine conservation reserves are vested in the Marine Parks and Reserves Authority under the CALM Act and the Department is responsible for their management. The CALM Act and Wildlife Conservation Act and associated regulations provide legislative protection for flora and fauna within the State.

In State controlled waters (up to 3 nautical miles), the DoF has statutory responsibility for the management and regulation of recreational and commercial fishing, aquaculture and pearling in accordance with the Fish Resources Management Act and the Pearling Act. These fisheries may have a direct (e.g. through access) or indirect impact on terrestrial reserves and proposed reserve additions. The DoF has prepared several fisheries management papers for the Shark Bay area to guide fisheries management.

While most fishing operations take place outside the planning area, roads and tracks are used to gain access to marine waters and boat launching and catch transfer may take place on land. Therefore, the use of vehicles, other equipment and power generators (for camping) can impact on the natural values of the planning area and the use and enjoyment of the area by other visitors.

Access through the planning area by commercial fishermen is important for their continued operation. The Department's Policy Statement No. 51 – *Access for Commercial Fishing through CALM Lands* (CALM 1993) recognises that existing rights of access will be maintained unless problems related to environmental degradation or conflict with visitor access and use occur.

Managed Fisheries

Commercial fisheries form an important social and economic component of Shark Bay and most of the commercial catch is processed in Carnarvon. In the Shark Bay area commercial fisheries includes:

- Shark Bay prawn managed fishery;
- Shark Bay scallop managed fishery;
- Shark Bay beach seine and mesh net fishery;
- specimen shell managed fishery;
- marine aquarium fish managed fishery;
- Gascoyne demersal scalefish fishery;
- western rock lobster and abalone fisheries; and
- an aquaculture industry (including pearling).

There is interest in the establishment of land based aquaculture for pearls and for the use of artesian water for aquaculture pursuits in Shark Bay. The establishment of land based aquaculture needs to be consistent with the draft *Aquaculture Plan for Shark Bay* (DoF 2004) and occur outside the planning area.

In Edel Land, roads are used by commercial beach seine and mesh net operators whilst commercial abalone fishermen use the tracks through Zuytdorp Nature Reserve to access offshore reefs. In Francois Peron National Park:

- roads are used by commercial beach seiners to launch boats and unload product at Big Lagoon, Cattle Well, Herald Bight and Cape Rose;
- roads are used by offshore aquaculture operators to access their operations;
- some roads that are not available for visitor use are occasionally used by commercial fishermen to access some sites; and
- commercial fishing has had little effect on the natural values of the Park other than contribute to the degradation of roads.

Commercial fisheries are prohibited from the Recreation and Sanctuary Zones of the Shark Bay Marine Park and therefore access to and use of the adjacent shoreline by commercial fishermen and visitors will require appropriate management.

49 – Commercial Fishing

Key Points

- Within State waters the DoF regulates and manages all commercial fishing operations.
- Some commercial managed fisheries rely on using selected beaches along the coastline to access marine waters.
- The use of vehicles, other operational equipment and power generators for overnight camping can affect the natural values of conservation reserves and the experience of other planning area users.
- The Department manages camping areas and access through the parks and reserves.
- The establishment of commercial fishing tour operations and facilities on Department-managed land will be controlled through the Department's commercial operators system.

The objective is to protect the natural and cultural values of, and visitors to, the planning area through minimising the on-shore environmental impacts from commercial fishing.

This will be achieved by:

1. ensuring the on-shore environmental and social impacts of commercial fishing operations within the planning area are minimised;
2. managing access by commercial managed fishery operators in accordance with Policy Statement No. 51 – *Access for Commercial Fishing through CALM Lands* (CALM 1993) and other relevant Departmental policies and guidelines; and
3. liaising with the DoF and commercial fishers to ensure that any changes to fishing operations do not adversely affect the key values of the planning area or experiences of other planning area visitors.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

50. WATER EXTRACTION

In general, proponents seeking to extract water from the planning area require a licence from the Department of Water, who administer the *Rights in Water and Irrigation Act 1914*. Such licences specify the amounts and conditions under which water may be taken. Conditions typically cover measurement and monitoring responsibilities of the licensee and specify constraints on the amount taken to ensure environmental impacts are acceptable and downstream flow regimes are maintained to meet environmental and social water needs.

The Department of Water (DoW), through the Gascoyne Murchison Strategy, implements the Carnarvon Artesian Basin Rehabilitation Project. This project provides a strategic approach to the rehabilitation of artesian bores within the basin with a view to reduce water wastage and improve artesian pressure (DoE 2004). The project is voluntary and seeks participation from local land holders who want to rehabilitate and control artesian bores on their properties and to replace associated bore drains with pipelines and troughs (DoE 2004).

Bores are located throughout the planning area and are used predominantly for fire management and road building purposes. Several bores have been rehabilitated as part of the Carnarvon Artesian Basin Rehabilitation Project. As part of this project a number of bores on Peron Peninsula and Nanga Peninsula have been decommissioned. The new Peron Homestead bore will remain the main source of water for the homestead area. Artesian bores are no longer located on the proposed Nanga Conservation Park. Water extraction from deep bores for the Steep Point area and Dirk Hartog Island National Park may be considered in the future. A list of bores in the planning area is provided in Table 23.

Proponents seeking to extract water from the planning area also require approval from the land manager (in this case the Department) to access the land for the purpose of extracting water. The Department may, after consultation with the Conservation Commission and with approval from the Minister for Environment, issue a Water Removal Permit for this to occur under section 101(1a) and (1e) for CALM Act land. This Permit can place conditions on the proposal (e.g. on the quantity of water extracted). Where infrastructure is required, a lease might also be issued. An assessment by the EPA may be required for projects with potentially significant environmental impacts. Where Water Removal Permits are issued by the Department to extract water from the bores in the planning area, the Department is responsible for the management of the bore infrastructure.

Several shallow aquifers of varying quantity and quality are located across Dirk Hartog Island National Park and are used for providing water to the homestead and for watering stock. Once stock and goats have been removed from the island, many of these water sources could be closed.

Water may be extracted from the sea using desalinisation. Desalinated water may be required in areas remote from alternative water sources such as bores and shallow aquifers. When using desalinated water, the implications for disposing of concentrated sea water waste will need to be considered. On Edel Land desalinated seawater is used to service the ranger residence at Steep Point and this will continue. Desalinated seawater may be used in conjunction with other proposed eco-tourism developments or the Department's operations centre on Dirk Hartog Island National Park.

Table 23: Artesian Bores in the planning area

Area	Bore	Action
Peron	Peron Peninsula No. 1 (Homestead)	Drilled 1921. Decommissioned in 1999. Licence relinquished.
	New Homestead bore	Drilled 1998 to a depth of 565 m with a flow of 432 m^3/day and pressure of 254 kPa. Has control headworks. Good condition. Retain.
	New Bore - Replacement Bore No. 2	Drilled in 1971. Decommissioned in 2002. Licence relinquished.
	Peron Peninsula No. 2 (original)	Drilled in 1955. Decommissioned in 2002. Licence relinquished.
	Peron No. 3 (Eagle Bluff)	Drilled in 1981. Reasonable condition. Retain for departmental uses.
	Peron No. 4 (10 Mile Bore)	Drilled in 1982. Decommissioned in 2002. Licence relinquished.
	Peron No. 5 (Monkey Mia)	Drilled in 1983. Has control headworks. Good condition. Retain for departmental uses.
	Monkey Mia Resort	Drilled 1988 to a depth of 472 m. Reasonable condition.
Nanga	Nanga No. 1	Decommissioned in 2003-04. Licence relinquished.
	Nanga No. 2 (Homestead)	Drilled in 1991 to depth of 350 m with flow rate of 2273m3/day. Reasonable condition.
	Nilemah Bore	Drilled in 1992/93 and flow rate of 6818m3/day. Has control headworks. Good condition. Transfer to LGA if required.
	Nilemah No. 1	Decommissioned in 2002-03. Licence relinquished.
	Nilemah No. 2	Depth 219 metres with a flow rate of 6818 k/l per day. Bore has failed and does not flow at surface.
	Petit Point Bore	Decommissioned in 2003-04. Licence relinquished.
	Farm Bore	Decommissioned in 2003-04. Licence relinquished.

Area	Bore	Action
	Lot 73 Nanga (Useless Loop Road)	Has control headworks. Good condition. Transfer to LGA if required.

Note: There are no artesian bores on Dirk Hartog Island, Edel Land or parts of Tamala and Murchison House stations in the planning area.

50 – Water Extraction

Key Points:

- A licence, administered by DoW, is required to take water in proclaimed areas or non-artesian groundwater areas proclaimed or prescribed under the Rights in Water and Irrigation Act.
- No water extraction can occur in the planning area without the Department permitting access for this purpose to the proponent. An assessment by the Department, the Conservation Commission or the Environmental Protection Authority may be required for proposals to extract water.
- The Carnarvon Artesian Basin Rehabilitation Project has decommissioned several bores across the Shark Bay area, although several remain free-flowing.

The objective is to conserve the water resource across the planning area through minimising water resource use.

This will be achieved by:

1. liaising with DoW to continue implementing a program of decommissioning bores as part of the Carnarvon Artesian Basin Rehabilitation Project;
2. continuing to liaise with DoW and other stakeholders on the use and management of ground water;
3. as required, issuing licences under the CALM Act for water extraction from bores and other water sources located within the planning area;
4. transferring responsibility of bores to the Shire of Shark Bay as noted in Table 23;
5. supporting investigations that assist in understanding the impacts of groundwater extraction in the planning area and adjacent areas;
6. establishing new bores if required;
7. referring any proposals for significant use of water resources to the EPA for formal assessment where such proposals are likely to adversely affect the key values of the planning area; and
8. following an appropriate level of assessment, and approval by the Conservation Commission, the Minister for Environment and DoW, the Department issuing a Water Removal Permit for the extraction of water from the planning area as required.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

51. POLLUTION AND WASTE MANAGEMENT

A range of potential pollution sources exist which could impact on World Heritage and natural values in the planning area. Atmospheric pollutants are derived from both human activity and natural processes. Atmospheric pollutants can have an effect on both human health and the wider environment. Shark Bay is a semi-enclosed embayment with a low flushing rate and therefore pollutants are likely to be slow to disperse. Although pollution is likely to have greater impact on the marine environment, there will be some associated impact on the adjacent terrestrial land. Potential sources of pollution include:

- atmospheric pollution, for example, industrial and vehicle emissions, carbon dioxide levels;
- marine pollution, for example, fuel and oil spills, littering (especially plastics and fishing line), bilge and ballast discharge from ships, and sewage;
- chemical, nutrient, or exotic biota pollution from existing industries, such as salt mining, aquaculture, and associated shipping activities;
- land pollution, for example, littering, urban, visitor, industrial and agricultural waste; solid and liquid human waste generated by visitors who inappropriately dispose of it;
- groundwater pollution, for example, seepage from septics, and nutrients and chemicals from agricultural activities;
- dust associated with mining and agricultural practices;
- bushfires; and
- noise pollution.

The Department is responsible for pollution control and abatement. DoW is responsible for managing water resources and generally the Water Corporation and/or the local authority is responsible for the disposal of sewage. The Department of Transport is responsible for shipping activities in State waters and in regard to oil spills, a State wide oil spill plan currently exists.

Waste can come from a variety of sources within the planning area and can include:

- visitor waste from camping and other recreational activities;
- waste associated with former pastoral leases; and
- the potential for the dumping of urban, agricultural and industrial waste in the planning area.

The management and, where required, rehabilitation of existing rubbish tips requires addressing, especially in remote localities such as Steep Point and Dirk Hartog Island National Park. There are old fence lines, poly pipe used to distribute water, and other rubbish associated with pastoral activities scattered across the planning area on Peron Peninsula, Nanga, Edel Land and Dirk Hartog Island National Park. Landholders will be responsible for managing waste generated by their operations. Best practice waste minimisation schemes, Government waste and litter management policies and legislation will be applied across the planning area. The management of rubbish from Dirk Hartog Island National Park will be included as part of the ecological restoration project for the island (see Section 21 – *Native Animals*). The Shire of Shark Bay by-laws and EPA regulations will apply to the management of waste in freehold enclaves within the planning area (for example the freehold lots on Dirk Hartog Island).

51 – Pollution and Waste Management

Key Points

- The semi-enclosed embayments with of Shark Bay low flushing rate is likely to result in a slow dispersal rate and greater impact from pollution in both the marine and adjacent terrestrial estate.
- Monitoring of activities likely to lead to pollution is essential to minimise the likely event and spread of pollution.
- Pollution and waste can occur at point sources as well as from a range of other operations such as mining, fishing and pastoral activities on adjoining lands.
- Waste from previous pastoral operations on acquired lands will require specific management in the future.

The objective is to protect the key values of the planning area through minimising the likely environmental impact from activities that might lead to pollution or waste.

This will be achieved by:

1. removing and the careful disposal of waste from the planning area including toilet waste, waste from pastoral activities and waste generated by visitors;
2. managing waste generated from Department operations appropriately and encouraging waste minimisation schemes;
3. monitoring potential sources of pollution that are likely to lead to pollution of the natural environment; and
4. liaising with relevant government agencies to prevent and minimise polluting activities.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

52. DEFENCE, EMERGENCY AND OTHER TRAINING

Defence force, emergency service and other types of training are an acceptable use of some lands and waters managed by the Department. Defence force training is most commonly undertaken by the Australian Army, but can also include occasional Air Force and Navy activities. Activities can range from movements by individual soldiers or small groups practising survival techniques, to major operations involving one or more battalions. Possible activities include survival and navigation exercises, military training, driver training, leadership and search and rescue training.

Management of defence force and emergency service training within the planning area is guided by Department's Policy Statement No. 54 – *Defence force training on CALM managed lands and waters* (CALM 1996a). To allow for defence force and emergency service training, a written proposal outlining activities will be required for assessment of the activity against the criteria detailed in the policy to determine the likely impacts and appropriate conditions applied.

Conditions may be imposed to ensure that environmental damage and the risk and disturbance to other users is minimised. For these reasons, some activities are not appropriate in certain categories of Department-managed lands and waters, such as national parks and nature reserves. In general, the following activities are not acceptable in the planning area:

- camping involving digging or soil disturbance, use of fire, rubbish disposal or construction of temporary toilets;
- group manoeuvres involving large numbers of personnel;
- damaging, cutting or destroying vegetation (e.g. for camouflage or concealment of personnel and equipment);
- carrying and use of firearms, ammunition or pyrotechnics;
- taking vehicles off roads and tracks (e.g. in deployment procedures);
- use of support or transport aircraft or power boats;
- survival training involving collecting and consuming native plants and animals regarded as bush tucker;
- use of domestic animals (e.g. dogs or pack animals); and
- building fortifications, weapons pits or other structures.

52 – Defence, Emergency and Other Training

Key Points:

- Defence and emergency services training may be an acceptable use of lands and waters managed by the Department but must be carried out subject to evaluation and in appropriate areas and manner that minimises the impact on the environment and the risk and disturbance to other users.
- Before any training exercise can be carried out within the planning area, a written application to the Department is required so that a full assessment of proposed activities can be made.

The objective is to protect the key values of, and visitors to, the planning area through minimising the environmental impacts from defence force and emergency service training activities.

This will be achieved by:

1. ensuring that activities are carried out in accordance with - Policy Statement No. 54 – *Defence force training on CALM managed lands and waters* (CALM 1996a);
2. continuing to liaise with the defence forces, Government Department's and other organisations likely to conduct training exercises in the planning area to:
3. ensure minimal impact techniques are adopted during training exercises; and
4. encourage the use of suitable alternative venues outside the planning area;
5. prohibiting training exercises in areas likely to cause unacceptable environmental damage or risk and disturbance to visitors to the planning area; and
6. developing a map that identifies areas suitable for training exercises within the Department's Shark Bay District.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

53. PUBLIC UTILITIES AND SERVICES

Services and infrastructure, such as roads, accommodation/housing, electricity, water, waste disposal, tourism developments, airstrips and communications are necessary to service the towns, pastoral stations and industries within and adjacent to the planning area as well as meeting Department operational requirements.

The provision of new services and infrastructure has the potential to impact on the natural and cultural values of the planning area, depending on their location and type. Such impacts may include the clearing of vegetation, the introduction of weeds, visual impacts and the destruction of important habitats.

The planning area is traversed by public access roads and there are road reserves for the Shark Bay Road (100 metres), the Denham-Monkey Mia Road (100 metres) and the Useless Loop Road (100 metres). Access roads within the planning area for use by the public are listed in Tables 7, 11, 14, and 18 and shown on Map 8 (see Section 32 – *Visitor Access – Vehicle Access*). Tracks not listed or shown may be used under permit conditions, or closed and rehabilitated. Access into the Zuytdorp cliffs via the State Barrier Fence will continue to require a permit from DoAF to use it. Construction of a two-wheel drive road through Zuytdorp Nature Reserve connecting Kalbarri and Shark Bay has been proposed in the past but is not supported.

Powerlines to connect Denham with Monkey Mia have been proposed and will require an environmental impact assessment. To ensure the development of this powerline, does not compromise the quality of the visual landscape, particularly clearing of a corridor, a visual landscape assessment will be applied.

Telstra telecommunications radio repeater towers are located at Monkey Mia and Nanga and towers servicing residences located at the Ranger's station at Steep Point. Reserve No 42398 located on Nanga is vested with the Australian and Overseas Telecommunications Corporation Ltd for the purpose of Repeater Station Site. Reserve No. 43272 near Monkey Mia is vested with Telstra Corporation Limited for the purpose of Radio Terminal Site. Within the road reserve of the Monkey Mia and Shark Bay Roads are located underground fibre optic communication cables. A telephone cable to the Peron Homestead precinct is located in Francois Peron National Park. Radio communications towers may be required in Dirk Hartog Island National Park and other places within the planning area.

Department VHF radio repeater towers are located in Francois Peron National Park as are towers for monitoring fauna fitted with radio tracking devices. Additional towers to service Edel Land and Dirk Hartog Island National Park might be required and if so then, visual landscape assessment procedures to ensure the towers do not compromise the landscape quality of the sites will be applied. Co-location of communication towers with other organisations will be encouraged.

The Australian Maritime Safety Authority operates five lighthouses which are located within reserved enclaves. Lighthouses are located on Bernier, Dorre and Dirk Hartog Islands and at Steep Point and Cape Peron.

Further staff accommodation and workshop facilities are being considered at Peron Homestead, Steep Point and new facilities in Dirk Hartog Island National Park including the provision of a range of utilities and services. The siting of the Ranger station at Dirk Hartog Island National Park will be assessed using a range of appropriate environmental, social and economic criteria.

Airstrips are located throughout the planning area and flying can be an efficient means of managing the area. The siting and construction of new airstrips or improvements to existing airstrips will require an environmental impact assessment and consideration of the appropriateness of existing airstrips (see Section 32 – *Visitor Access – Air Access*).

An internal assessment process will be applied when assessing proposed infrastructure and services developments. Future proposals for infrastructure, utilities and services will be assessed to determine physical, biological, visual, operational and social impacts. Some parts of the planning area, such as Bernier and Dorre Islands, have significant conservation value and establishing utilities in such areas is inappropriate. Proposals that are likely to have a significant adverse impact on the environment will be referred to the Environment Protection Authority for environmental impact assessment. Utilities and services in the planning area should be sited and constructed to minimise these impacts.

The appropriate siting of corridors for establishing utilities and services as well as constructing infrastructure can be achieved by applying visual landscape management techniques and appropriate environmental impact assessment to ensure no detrimental impacts on natural values and habitats. These are designed to minimise the loss of visual amenity often associated with these facilities (see Section 37 – *Visual Landscape*).

Rehabilitation and remediation techniques may be needed to reduce soil erosion and to minimise the introduction of weeds and disease (see Section 48 – *Rehabilitation*). Use of pre-existing corridors can minimise the impact and cost of establishing and maintaining these facilities. Where possible, the siting of structures should be directed outside the planning area.

53 – Public Utilities and Services

Key Points:

- Utility corridors allow power, water or communication services to be provided to enclaves of private property within the planning area.
- Impacts of construction and maintenance of these corridors include loss of visual amenity, impacts on conservation assets, soil erosion, weed introduction, disease spread and associated access problems.
- Specific sites may be sought within the planning area to provide telecommunications facilities to the public or private agencies.

The objective is to protect the key values of the planning area through minimising the environmental impacts of siting and constructing utilities and services.

This will be achieved by:

1. permitting new utilities and services within the planning area where there are no viable alternatives and where they are consistent with Government policy and do not impact on the key values of the planning area. Where possible, new services and utilities should be located outside the planning area in areas where their impacts can minimised;
2. encouraging new utilities and services within the planning area to be developed using existing utility corridors and structures;
3. permitting the co-location of structures on Department-managed lands provided that Department operations are not impeded;
4. ensuring that land disturbed by the installation and/or maintenance of public utilities is adequately rehabilitated at the expense of the responsible authority;
5. implementing landscape management techniques to minimise the impacts of any essential utility corridors or structure that exists or is proposed in or near the planning area (see Section 37 – *Visual Landscape*);
6. applying appropriate environmental, social and economic assessment criteria to measure the impact of proposed infrastructure and services; and
7. liaising with the prime users of infrastructure and utility corridors to ensure responsible management of environmental issues, such as soil disturbance, weeds, fire, and the spread of disease.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

54. SCIENTIFIC AND RESEARCH USE

The natural, cultural and recreation values of protected areas make them desirable sites for research. Already, there is a considerable amount of scientific knowledge about Shark Bay's natural environment and visitor use (see *Bibliography*). Across the planning area, archaeological research has been undertaken to date the occupation and use of the area by Aboriginal people. The European exploration and settlement of the area has been well documented. Vegetation and flora surveys have been conducted across much of the planning area including marine and terrestrial areas. Native fauna species identified for reintroduction to Peron Peninsula have been researched to varying degrees as has techniques to control introduced animals such as rabbits, cats and foxes.

However, there are knowledge gaps and the level of understanding is often inadequate for management purposes or for determining the consequences of decisions on economic, environmental and social aspects. Further management-oriented research is required, particularly on the impact of human activities and the processes threatening natural, cultural and recreation values. Almost all ecosystems and species within the planning area require a minimum of baseline monitoring to establish current condition and health, so that the impact of future human and management activities can be established.

Research activities are supported by the Department where they contribute to the understanding of natural and social processes within the planning area, and where research activities do not themselves threaten or disrupt these processes. Research may be undertaken by Department staff or by external organisations and individuals. Research undertaken by external organisations such as universities and research centres require a permit issued by the Department's Nature Protection Branch. It is a condition of the permit system that results of studies are forwarded to the Department.

The Department has built relationships with universities to conduct social research in parks and reserves, principally through the Nature-based Tourism Research Reference Group. The group comprises representatives from the Department and all Western Australian universities. The group assists the Department by identifying suitable student university researchers to investigate possible management solutions to visitor issues. Projects are usually identified by field staff and listed on the Department's website (www.dec.wa.gov.au).

The Shark Bay World Heritage Property Scientific Advisory and Community Consultative Committees provide guidance on appropriate research projects. For more information on scientific research to be undertaken by the Department in the planning area, see Section 57 – *Research and Monitoring*.

54 – Scientific and Research Use

Key Points:

- Protected areas are a valuable resource for a wide range of research projects.
- Addressing management issues without adequate knowledge is difficult and requires appropriate decision-making processes.
- Although there is a significant amount of scientific knowledge about Shark Bay's natural and cultural environment and visitor use, there are still many knowledge gaps and an inadequate level of understanding for management.
- Wildlife research within the planning area requires a permit from the Department's Nature Protection Branch.
- The Nature-Based Tourism Research Reference Group provides a link between university students and the Department in carrying out visitor related research.
- The Shark Bay World Heritage Property Scientific Advisory and Community Consultative Committees provide advice on relevant research requirements for the Property.

The objective is to ensure research in the Shark Bay area will assist in achieving the objectives of this management plan or other Departmental objectives.

This will be achieved by:

1. assisting, wherever possible, internal research staff, external organisations and individuals where their research relates to key values of the planning area;
2. permitting and facilitating external research organisations and individuals to undertake research by issuing an appropriate permit that specifies conditions under which work may be carried out and results disseminated;
3. promoting research findings and opportunities for ongoing multi-disciplinary research; and
4. proposing nature-based tourism research projects through the Nature-Based Tourism Research Group for listing on Naturebase and availability to students.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

PART G. INVOLVING THE COMMUNITY

Community involvement includes public participation, interpretation and education programs, volunteers, "friends of" and advisory groups as well as liaison, consultation and advisory services to stakeholder groups. The planning area provides a valuable opportunity for the community to experience coastal and arid environments, its landscapes and seascapes, and to learn about World Heritage, natural and cultural values. An effective communication program is vital to achieving the vision and objectives of this management plan. It informs the public of the attractions, facilities, opportunities and interpretive services available, and assists in increasing appreciation and understanding of natural and cultural environments. It also fosters a sense of community ownership of the planning area, engenders support for management and encourages appropriate behaviour. Communication is also vital in managing visitor risk so visitors have safe, enjoyable experiences in the planning area.

Various Departmental policy statements provide management direction for involving the community including:

- Policy Statement No. 15 – *Community involvement (Public Participation and Volunteers)* (CALM 1991);
- Policy Statement No. 18 – *Recreation, tourism and visitor services* (DEC 2006b);
- Policy Statement No. 25 – *Community education and interpretation* (CALM 1988); and
- *Good Neighbour Policy* (DEC 2007)

Further guidance is provided by the Visitor Interpretation Manual and best practice principles.

A range of communication strategies that target different audiences is used, including: information; interpretation; education; community involvement; and liaison, consultation and advisory services to stakeholder groups.

55. INFORMATION, INTERPRETATION AND EDUCATION

Information about the planning area's access, facilities, attractions, activities, regulations, code of care and costs is provided by the Department through park and reserve signage, print media, the Department's website and public contact with Department staff. Information is also widely available from many external sources, including tour operators and the tourism industry. The delivery of consistent and accurate information by both internal and external providers is important in achieving effective communication.

Interpretation is the craft of explaining and enriching visitor experiences and appreciation of the natural and cultural features and is an interactive process involving the visitor, the interpretive medium and the setting. Interpretation is a process and an opportunity for translating stories of places, the biota and people in terms that motivate and inspire visitors to greater understanding and care. The interpretation of the key values to visitors is integrated with recreation and tourism planning and site developments (see Part F *Managing Visitor Use*).

Education is a series of linked learning programs with defined outcomes in mind. Education programs including presentations, organised field activities and other programs are targeted at specific user groups and facilitate learning and foster greater appreciation and understanding of the area's key values. The planning area provides a base for a range of opportunities for education programs for schools in the region, and the Department often liaises and is involved with local schools.

Planning for Community Involvement

Community involvement is about communicating and engaging with the community. A community education coordinator was appointed to develop comprehensive and integrated communication and interpretive plans for the Shark Bay World Heritage Property, in consultation with the local community and key stakeholders. The result was two reports: *Shark Bay World Heritage Area Communication Strategy* (Chapman 2002) and *Shark Bay World Heritage Area Interpretation Action Plan* (Chapman 2003b). These documents provide comprehensive and detailed guidelines for presenting information to the community and visitors.

The *SBWHP Communications Strategy* (Chapman 2002) aims to develop communications for the Shark Bay World Heritage Property which meet conservation and environmental objectives, as well as community aspirations (social and economic) for the area whilst enhancing visitor experience and satisfaction. Communication objectives were developed in consultation with stakeholders as follows:

- Knowledge/Appreciation Objectives
  1. Increased awareness and appreciation for World Heritage values;
  2. Increased understanding of what World Heritage listing means;
  3. Increased awareness and understanding of Shark Bay's natural environment and how it works;
  4. Increased awareness of what to expect from a visit to Shark Bay;
  5. Increased awareness of and appreciation for Shark Bay's cultural history; and
  6. Increased understanding of fish ecology and awareness of fishing impacts.

- Behavioural Objectives
  1. Improved responsibility on land;
  2. Improved responsibility among fishers;
  3. General improvement in responsibility;
  4. Improved responsibility among boaters;
  5. Improved responsibility among divers and beachcombers;
  6. Increased community involvement and ownership;
  7. Increased visitor numbers in off-peak times and extending visitor stays; and
  8. Reduced tourism impacts on the local community.

The *SBWHP Communication Strategy* (Chapman 2002) adopts the 'Best Practice Model' developed by the ANZECC Working Party and applies the model through several implementation strategies built around identifying the key audience groups and the primary communication of the objectives listed above. The key audience groups are visitors, local residents, Perth residents, agency staff and tour operators and their staff.

The *SBWHP Interpretation Action Plan* (Chapman 2003b) provides a blue print for developing interpretation products across the Shark Bay World Heritage Property and coordinating the efforts of the various agencies and bodies who are undertaking interpretive activities in the area. The 'story' to be told across the Property involves presenting information on four groups of people: the Indigenous people, the maritime explorers, the settlers, and the global community. Story elements can be linked to specific sites. The Interpretation Action Plan develops a number of themes and story elements for each of these four 'stories' (see Appendix 10). Themes can be communicated through a variety of interpretive techniques or media (e.g. signs, exhibits, publications, guided tours, electronic media and training programs).

A number of projects outlined in the Interpretation Action Plan are either completed or underway. The Style Manual, Image Library, Monkey Mia walk trail, Monkey Mia Magic brochure upgrade, Francois Peron brochure upgrade and orientation sign, Skipjack Point walk trail, Cape Peron signage a new display at the Overlander Roadhouse and an interpretive boardwalk at Eagle Bluff, have all been completed. The development of a new Shark Bay World Heritage website, (www.sharkbay.org), represents a major development in providing information to visitors. Projects still in progress include the redevelopment of facilities at Little Lagoon. Numerous other projects are earmarked for completion in the near future.

Shark Bay Programs

The Department's information, interpretation and education programs can be divided into two broad categories – face-to-face public contact programs (e.g. talks, educational activities, guided walks and other experiences) and interpretive media (e.g. displays, signage, merchandise, electronic media and publications).

Public Contact Interpretation

Within the Shark Bay District, the delivery of face-to-face interpretive and educational programs is a priority and has a high level of commitment. The Monkey Mia dolphin talks conducted by the Department are presented to about 100,000 people annually and therefore are the most important interpretive activity in the District. These talks play a pivotal role in educating the public and raising awareness on issues such as dolphin conservation, the importance of the Shark Bay World Heritage Property and appropriate visitor behaviour. The Department's aim is to maintain the quality of these presentations to ensure interpretive objectives are met.

A number of other interpretive and educational programs are offered in the World Heritage Property, particularly as part of school holiday programs. Guided experiences include bird watching, activities about bilbies and other threatened animals, safe diving and snorkelling practices, viewing marine life, spear throwing and talks on research conducted in Shark Bay area including Denham and Little Lagoon.

The Department also offers a wide range of interpretive and educational programs across the State, including support for the 'Bush Ranger' program, which is part of the broader 'Cadets WA' program, that aims to give secondary school-aged youth the opportunity to participate in personal development training that provides practical life skills, develops leadership, teamwork and initiative skills, and fosters qualities of community responsibility and service. The program may be offered in Shark Bay in the future.

In the past the Department's EcoEducation program has been conducted at Francois Peron National Park. It aims to involve schools and their communities in biodiversity conservation and provides classroom resources, professional learning for teachers and engaging excursions and camps for participants. The camps give teachers and students the opportunity to be involved in hands-on activities in managing plants and animals and interaction with Department staff, rangers, scientists and nature conservation officers. EcoEducation programs also provide tertiary and TAFE students with valuable field experience in biology and nature conservation.

Interpretive Media

There are numerous interpretive facilities, services and products available across the planning area ranging from large visitor centre displays to small publications. The aim with all of these is to educate and inform the public about the natural and cultural values of the World Heritage Area.

The newly constructed Shark Bay World Heritage Discovery Centre in Denham, opened in early 2006 and managed by the Shire of Shark Bay, showcases the key values of the Shark Bay World Heritage Property. The Centre's interactive and static displays offer an insight into the traditional use of the area from the earliest Indigenous occupation, through early European maritime exploration to the human use of modern times. Outstanding audio-visual displays also present the area's world class natural World Heritage, natural and cultural values in an easily digestible and interesting manner.

The Monkey Mia Visitor Centre managed by the Department, is another significant interpretive centre that houses static and interactive displays on the natural and cultural values of the World Heritage Property. The display focuses on dolphins, land, water and coastal communities.

Peron Homestead contains a small display on Project Eden, a special wildlife conservation program to reintroduce threatened fauna back onto Peron Peninsula. A number of interpretive signs and a themed interpretive walk are also provided within the precinct.

Interpretation on Shark Bay is provided at the Overlander Roadhouse. Numerous interpretive walks are provided across the World Heritage Property including Hamelin Pool, Monkey Mia, Eagle Bluff, Skipjack Point, and Peron Homestead. Other interpretive walks could be developed, especially on the new conservation reserves. Such sites could include Cape Inscription, Quoin Bluff South, Notch Point, Steep Point and False Entrance.

A large number of publications have been produced by the Department to help orientate and educate visitors to the World Heritage Property. At present there are more than 15 publications in circulation and there is a strong need to rationalise these to reduce costs and provide a more targeted and effective program. The development of a new website for the World Heritage Property has gone some way in improving the quality and accessibility of information available to the public.

Communication Planning

Communication planning will be done in conjunction with recreation site planning and development to identify the best means of conveying communication messages at individual recreation sites in the context of broader planning area communication and other management objectives. Communication of messages pertinent to Indigenous cultural heritage must involve traditional custodians (see Section 6 – *Management Arrangements with Aboriginal People* and Section 28 – *Indigenous Heritage*).

There are also opportunities within Shark Bay for cooperative interpretive projects between the Department and other stakeholders such as other Government departments, Local Government and tourism businesses, particularly in communicating the World Heritage values and other key values of the planning area. For example, the development and implementation of the Style Guide involved a range of stakeholders in the Shark

Bay area and has ensured that interpretive and promotional material provided at different locations across the World Heritage Property is of a consistent style and standard.

55 – Information, Interpretation and Education

Key Points

- The Communication Strategy and Interpretation Action Plan for the Shark Bay World Heritage Area provide the basis for increasing visitor awareness and appreciation of world heritage and other key values.
- Shark Bay provides excellent opportunities to promote awareness of the World Heritage, natural, cultural and recreation values of the planning area and their conservation and management.
- Peron Homestead provides the infrastructure and facilities for conducting educational programs on conservation and management.

The objective is to promote community awareness, understanding and appreciation of the World Heritage and other key values of the planning area and engender support of management activities.

This will be achieved by:

1. providing information to visitors on the World Heritage, natural and cultural values and appropriate activities and behaviour;
2. ensuring the information, interpretation and education provided is guided by the Communication Strategy and the Interpretation Action Plan and the objectives, strategies, stories and themes outlined in these documents;
3. providing interpretation at both existing and proposed key entry and visitor sites including Overlander Roadhouse, Monkey Mia airport, Eagle Bluff, Red Cliff, Steep Point, Shelter Bay, False Entrance, Cape Inscription and Dirk Hartog Island homestead.
4. ensuring that traditional custodians have a primary and active role in communication planning pertinent to Indigenous cultural heritage;
5. ensuring that commercial tour operators have relevant and factual interpretive material that enables them to provide quality service in communicating messages regarding the key values and management;
6. offering interpretation accreditation/certification course to tour operators;
7. supporting and encouraging opportunities for joint interpretation between the Department and other stakeholders in the planning area; and
8. liaising with tourism agencies regarding communication issues as necessary.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
55.1 Level of visitor satisfaction with education and interpretation opportunities available.	55.1 Remains stable or improves over the life of the plan.	Every five years.
55.2 Number of hits to the Shark Bay World Heritage Property website	55.2 Number of hits increases over the life of the plan.	Annually.

56. WORKING WITH THE COMMUNITY

Key functions of the Department and the Conservation Commission are to promote and facilitate community involvement in management of conservation lands. The community, as groups or individuals, is encouraged to be involved in both the planning and management of many of Department's activities, including volunteer programs.

The CALM Act (sections 14, 33A and 57-59) provides for public participation in the preparation of management plans. In preparing this management plan, the community has been involved by providing initial comments on their perspective of the issues within the planning area via written submissions and consultation meetings. In particular, members of the Shark Bay Community Advisory Committee provided advice to the management planning team on many issues addressed during the planning process. Interested community members and organisations had the opportunity to formally comment on the draft management plan.

Ongoing community support is essential for the successful implementation of the approved final management plan. The involvement of Aboriginal people, adjacent landowners and managers, planning area users, tour operators and interest groups is important to the conservation of the planning area's key values. This will enhance integrated land management, which is particularly important where management issues, such as fire, weeds, introduced animals and visual land management, go beyond the boundaries of the reserves. Principles for effective neighbour relations outlined in the Department's *Good Neighbour Policy* (DEC 2007) are important for developing partnerships with the community.

Community members are encouraged to take part in volunteer activities in the planning area such as visitor surveys, clean up days, office assistance, campground hosting, assistance with Monkey Mia operations, Project Eden operations, assistance with rehabilitation works, maintenance, such as erosion control, weed removal, track maintenance, and visitor and wildlife data collection. Volunteer activities not only increase the Department's work capabilities and skills base, but also foster greater understanding with the community. During 2005-06, 184 volunteers contributed over 13,000 hours to the Shark Bay District.

Working together with Aboriginal people to 'care for country' will assist heritage preservation and the conservation of the environment, as well as enrich cross-cultural awareness. The future involvement of Aboriginal people in management of the planning area will be considered in light of the Government determining a policy position and providing adequate resources (see Section 6 – *Management Arrangements with Aboriginal People*).

56 – Working with the Community

Key Points

- Community involvement and support are critical to the successful implementation of this management plan.
- The Department supports voluntary activities, which contribute to the protection of key values of the planning area, building community awareness, understanding, appreciation, commitment and the achievement of management objectives.

The objective is to facilitate effective community involvement in the management of the planning area.

This will be achieved by:

1. continuing to provide and promote opportunities for involvement of interested community members in the management of the planning area including local Aboriginal people, neighbours, local Government authorities, relevant Government agencies, various advisory committees and other stakeholders;
2. continuing to support volunteer involvement in Department programs; and
3. as required, investigate options for establishing an advisory committee to provide advice to the Department in implementing strategies of the management plan.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
56.1 The number of registered volunteers and the level of volunteer hours.	56.1 An increase in the number of registered volunteers and the level of volunteer hours.	After five years.

PART H. MONITORING AND IMPLEMENTING THE MANAGEMENT PLAN

57. RESEARCH AND MONITORING

Knowledge, through research and monitoring, are essential components of management and are required to effectively implement and measure the success of this management plan. Whilst monitoring might be defined as an examination of performance, research is the acquisition of new knowledge. Research can be an inventory (what is there and where it is), baseline (how do the value characteristics vary naturally), process oriented (define the ecology of the value and factors that influence its health) or predictive (models that allow forecasting of what may occur). The acquisition of knowledge needs to be multidisciplinary and integrated and the community needs to be involved in the process of obtaining knowledge.

Research and monitoring can increase knowledge and lead to a better understanding of the key values of protected areas, aid performance assessment and provide a scientific basis for improving and adapting future management to achieve best practices. 'Adaptive management' is a process of responding positively to change, where the management of complex natural systems builds on common sense and learning from experience, experimenting, monitoring, and continually improves and adjusts practices based on what was learnt. This plan utilises best available knowledge to develop practices aimed at meeting specific management objectives. Monitoring, regular review and analysis of management outcomes and ongoing research are critical if land management in the region is to continuously improve.

It is appropriate that research and monitoring involve a wide range of organisations and groups. The involvement of volunteers, educational institutions and individual researchers can extend and improve research efforts and reduce research and monitoring costs. Opportunities for the department to develop partnerships with researchers would significantly increase the knowledge of the planning area and lead to improved decision-making.

Within the planning area, the Department's Science Division undertakes research principally on biological values, with assistance from branch, regional and district staff, and as part of larger State-wide projects. The Shark Bay World Heritage Property Scientific Advisory Committee was formed to provide advice on research requirements for the Property.

Nature-based tourism and social research is conducted or facilitated by the Parks and Visitor Services Division, principally through Visitor Satisfaction Surveys, the Visitor Statistics ('VISTAT') Program, the Nature-based Tourism Research Reference Group (NTRRG), and the Sustainable Tourism Cooperative Research Centre (STCRC). In partnership with the STCRC and other protected area management agencies in Australia, the Department is currently involved in a project to develop indicators for sustainable visitor-use management of protected areas and, most importantly, to recommend future research directions to the STCRC. This will significantly contribute towards the development of a State-wide visitor impact assessment process for visitor impacts in natural areas across the State and in the planning area.

Departmental research activities are subject to a prioritisation process for research across the entire conservation estate. For example, the Department gives priority to:

- describing and documenting Western Australia's biological diversity;
- providing knowledge on how best to conserve the State's biodiversity; and
- increasing knowledge of visitor use patterns and profiles (e.g. demographics, level of use of recreation sites, visitor expectations and perceptions).

Allocating priority for research across the State may result in the implementation of programs that have relatively little direct management application to the planning area but significant application to the broader conservation estate and species or communities elsewhere.

Within the planning area, the focus for monitoring is outlined in the plan's performance assessment process. The protection of key values within the planning area are associated with key performance indicator (KPI) with a performance measure, target and reporting requirement, which guides monitoring within the planning area (see Section 12 – *Performance Assessment and Monitoring* and Appendix 1).

Research and Monitoring Projects for the Planning Area

In preparing the draft management plan, the following knowledge gaps for the planning area have been identified by May and McKenzie (2003) for the three bioregional sub-regions of which the planning area is part of (Geraldton Hills, Edel and Wooramel), the Shark Bay World Heritage Property Scientific Advisory Committee and other sources:

- finer scale (1:50,000), floristic vegetation mapping – the current vegetation mapping is very broad scale (1:250,000) and does not adequately reflect known natural values;
- invertebrate fauna surveys – although some invertebrate surveys have been conducted, it focused on selected taxa, sites selected were widespread and have had limited sampling;
- vertebrate fauna surveys – although regional vertebrate surveys have been conducted, sites selected were widespread and have had limited sampling; some long term sampling has commenced on Francois Peron National Park;
- floristic surveys – although regional surveys of flora have been undertaken, sites selected were widespread and have had limited sampling;
- habitat requirements of species – there is limited data on habitat requirements of virtually all invertebrate species, most ephemeral plants, persisting critical weight range mammals, and uncommon vertebrate and plant species;
- life history attributes and population dynamics – there is no data on life history attributes of most flora and fauna species, especially species of conservation significance, and changes over time;
- impacts of exotic predators – little quantitative data exists;
- impacts of weed colonisation – no quantitative data exists;
- impacts of fire – no quantitative data exists;
- impacts of introduced herbivores – limited quantitative data exists;
- impacts of animal diseases – limited data exists;
- threatened species monitoring – there is some long term (but patchy) monitoring of some vertebrate fauna (i.e. mammals) but limited data exists on other threatened species (reptiles, birds and amphibians);
- knowledge of Indigenous occupation and use – although some parts of the planning have adequate surveys, sites selected are widespread and many areas, particularly the newly acquired lands, have yet to be surveyed;
- knowledge of non-Indigenous occupation and use – although some parts of the planning have adequate surveys, sites selected are widespread and some areas have yet to be surveyed;
- evolution of birridas – limited knowledge of the geology and biology of these evaporative saltpans;
- shell deposits – physical processes governing the formation of shell deposits in L'haridon Bight;
- hydrological processes – impact of water extraction on terrestrial and marine environments;
- impacts of changing climate on threatened species – lack of long term monitoring of all threatened species limits ability to quantify changes to flora and fauna populations over time;
- impacts, experiences and needs of visitors to specific sites in Shark Bay such as Shelter Bay, west coast of South Peron – this requires some baseline surveying of current situation;
- sustainable visitor capacity at key visitor sites such as Monkey Mia – increasing numbers of visitors to the dolphin interaction area at peak periods needs to be continued monitoring;
- investigate the Zuytdorp area to increase knowledge of natural and cultural values as well as implications for future gazettal and management as a wilderness area.

There is an ongoing need to monitor for potential adverse impacts of visitor use on the key values of the planning area.

57 – Research and Monitoring

Key Points

- Research and monitoring are important components of park and reserve management, and are required to effectively implement and measure the success of this management plan.
- The involvement of volunteers, educational institutions and individual researchers can reduce research and monitoring costs, thereby helping to provide quality information for the benefit of the broader

community.

- Departmental research and monitoring activities in the planning area are subject to a prioritisation process for research across the entire State.

The objective is to increase knowledge and understanding of key values, natural processes and visitor needs and use to provide for improved management of the planning area and to monitor the possible impacts associated with implementing the management plan.

This will be achieved by:

1. identifying and implementing integrated research and monitoring programs that improve management within the planning area;
2. establishing baseline monitoring programs for assessing the condition of natural and cultural values of the planning area and the impacts of human activities and management programs within the life of this plan;
3. supporting individuals and organisations to conduct integrated research and monitoring programs that improve management;
4. focussing research and monitoring on addressing issues and protecting key values relevant to successfully implementing this management plan and establishing baseline information for future auditing;
5. undertaking social research, including the Department's Visitor Satisfaction Survey and Visitor Statistics Program and projects nominated through the Nature Based Tourism Research Reference Group (see Section 31 – *Recreation and Tourism Opportunities*);
6. researching habitat requirements of selected threatened or restricted fauna and threatened ecological communities (see Section 21 – *Native Animals*);
7. providing information gained through research, monitoring and experience to the Department including the Region and District where it can be stored in libraries and databases, updated when required and used, if necessary, to modify management practices;
8. incorporating research and monitoring findings into interpretive and educational material where appropriate;
9. assisting, wherever possible, internal research staff and external organisations and individuals where their research relates to key values of the planning area;
10. ensuring that research and monitoring activities do not adversely impact on the key values of the planning area;
11. issuing permits with conditions to approved organisations and individuals to conduct appropriate research; and
12. pursuing external funding sources to assist in achieving research and monitoring objectives.

Key Performance Indicators:

There is no Key Performance Indicators for this section.

GLOSSARY

1080	A naturally occurring toxin (sodium fluoroacetate) found in many native Australian plants known as poison peas (*Gastrolobium* sp.).
A Class Reserve	Classification under the Land Administration Act 1997 reflects security of tenure, level of approval required to alter the reserve's area, purpose or classification. Changes to A Class reserves require approval by both Houses of Parliament.
Aquifer	A layer of rock which holds and allows water to move through it, and from which water can be extracted.
Benthic	Occurring at, or relating to, the bottom of a body of water
Biodiversity	Biodiversity in the context of this management plan can be defined as "the variety of all life forms: the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form; often considered at three levels: genetic diversity, species diversity and ecosystem diversity".
Biogeography	The study of both geography and biology including the relationships between plants, animals, soils, water, climate and humans.
Bioregion	A land and water territory whose limits are defined not by political boundaries, but by geographical limits of human communities and ecological systems.
Biosphere reserve	Protected areas of representative terrestrial or coastal environments that have been internationally recognised within the framework of UNESCO's MAB program for their values in conservation and in providing the scientific knowledge, skills and human values to support sustainable development (Biosphere reserve nomination form 1994).
Biotic	Of, or relating to living things; caused or produced by living organisms.
Birrida	A salt pan or low lying area that is subject to seawater incursions.
CAR (Comprehensive, Adequate and Representative) Reserve System	The terms comprehensive, adequate and representative together describe the attributes of an ideal reserve system. These terms are defined in the Australian and New Zealand Environment and Conservation Council's *Guidelines for Establishing the National Reserve System* as: ❖ comprehensiveness – inclusion of the full range of ecosystems recognised at an appropriate scale within and across each bioregion; ❖ adequacy – the maintenance of the ecological viability and integrity of populations, species and communities; and ❖ representativeness – the principle that those areas that are selected for inclusion in reserves reasonably reflect the biotic diversity of the ecosystems from which they derive. In addition to using the scientifically-based CAR criteria, spectacular landforms and scenery as well as natural areas of high public use are also commonly included in parks and reserves.
Catchment	The surface area from which water runs off to a river or any other collecting reservoir
Climate Change	Climate change is a result of global warming, caused by increases in the concentrations of greenhouse gases such as carbon dioxide, methane and nitrous oxide.
Commercial concession	A lease or licence, administered by the Department to conduct commercial operations on lands or waters held by the Conservation Commission or the Marine Parks and Reserves Authority.
Conservation	The protection, maintenance, management, sustainable use, restoration and enhancement of the natural environment
Critical weight range mammals	Mammals weighing between 35 grams and 5.5 kilos.
Cultural Significance	In accordance with the meaning in the Burra Charter, cultural significance means aesthetic, historic, scientific or social value for past, present or future generations.
Culturally Significant Place	The use of the term place in this context has the meaning defined in the Burra Charter, that is, of a site, area, land, landscape, building or other work, group of buildings or other works, and may include components, contents, spaces and views.
Declared rare flora/fauna	Threatened flora or fauna gazetted under the Wildlife Conservation Act.
Declared species	Either plants that are declared as weeds or animals that are declared as pests. A list of declared species, with their levels of declaration in various areas of the State is published annually in the Government Gazette pursuant to Section 37 of the

	Agricultural and Related Resources Protection Act.
Ecological community	A naturally occurring biological assemblage that occurs in a particular type of habitat.
Ecosystem	A community or an assemblage of communities of organisms, interacting with one another and the environment in which they live.
Eco-accommodation	Accommodation built in a natural setting that is well integrated into the natural landscape, relies on renewable energy resources, is built with environmentally sensitive materials, manages waste in a sustainable manner and involves local communities during the planning, development and operational stages.
Eco-tourism	Environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy, study and appreciate nature (and any accompanying cultural features – both past and present), that promotes conservation, has low negative visitor impact and provides for beneficially active socio-economic involvement of local populations.
Eco-lodge	A category of accommodation that meets the philosophy and principles of ecotourism, that requires special care in design, construction and operation so as not to destroy the very resources or qualities tourists come to experience. An eco-lodge should utilise sustainable power, be low energy and incorporate passive design, have minimal water use, and have ecologically sensitive waste disposal and recyclable processing of all waste with no pollutant product.
Endemic	Flora or fauna that is confined in its natural occurrence to a particular region.
Environmental Offsets	Environmental offsets aim to ensure that significant and unavoidable adverse environmental impacts are counterbalanced by a positive environmental gain, with a goal of achieving a 'net environmental benefit'.
Environmental weed	An unwanted plant species growing in natural ecosystems that modifies natural processes, usually adversely, resulting in the decline of the communities they invade; usually an introduced plant.
Epoch	A unit of geologic time that is a division of a period.
Estuarine	Relating to a water passage where the tide meets a river current; especially an arm of the sea at the lower end of a river.
Eutrophication	The enrichment of water by nutrients, such as compounds of nitrogen or phosphorus. It causes an accelerated growth of algae and higher forms of plant life. These consume more oxygen often leading to an oxygen deficit, which can have a major detrimental effect on the fish other aquatic organisms.
Exotic	A species occurring in an area outside its historically known natural range as a result intentional or accidental dispersal by human activities.
Fauna	The animals inhabiting an area; including mammals, birds, reptiles, amphibians and invertebrates. Usually restricted to animals occurring naturally and excluding feral or introduced animals.
Feral	A domesticated species that has become wild.
Fire regime	The combination of season, intensity, interval, extent and patchiness of fire in a given area over time.
Flora	The plants growing in an area; including flowering and non-flowering plants, ferns, mosses, lichens, algae and fungi. Usually restricted to species occurring naturally and excluding weeds.
Geoheritage	State-wide to nationally significant features of geology, including igneous, metamorphic, sedimentary, structural, palaeontologic, geomorphic, pedologic or hydrologic attributes that offer important information or insights into the formation or evolution of the continent; or that can be used for research, teaching or as a reference site.
Geology	The study the history of the earth and its life especially as recorded in rocks.
Geomorphology	The study of the earth surface features and their formation.
Groundwater	All free water below the surface in the layers of the Earths crust.
Habitat	A component of an ecosystem providing food and shelter to a particular organism.
Herpetofauna	Reptiles and amphibians.
High Water Mark	In relation to tidal waters means highest level of water at spring tides.
Holocene	The present geological time period commencing 10,000 years ago.
Hydrology	The scientific study of the characteristics of water, especially of its movement in relation to the land.
Indicator Species	A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in

	environmental conditions as well as aspects of community composition.
Indigenous	Native or belonging naturally (to a place).
Intertidal	Between the levels of low and high tide (also known as the littoral zone).
Introduced species	See *Exotic.*
Invertebrate	Animals without backbones, for example, insects, worms, spiders and crustaceans.
Jurassic Period	The Jurassic period is a major unit of the geologic timescale that extends from about 195 million years BP at the end of the Triassic to 135 million years BP at the beginning of the Cretaceous. The Jurassic constitutes the middle period of the Mesozoic era, also known as the Age of Dinosaurs. The start of the period is marked by the major Triassic-Jurassic extinction event.
Key performance indicators	The minimum set, which if properly monitored, provides rigorous data describing the major trends in, and impacts on, Australian biodiversity.
Landform	All the physical, recognisable, naturally formed features of land having a characteristic shape. Includes major forms such as a plain, mountain or plateau, and minor forms such as a hill, valley or alluvial fan.
Landscape Character Type	A broad scale area of land with common visual characteristics based on an amalgamation of landform, climate, vegetation, water form and land use patterns
Lithology	The study and description of the general, gross physical characteristics of a rock, especially sediments composed mainly of broken fragments of pre-existing minerals or rocks that have been transported from their places of origin, including colour, grain size, and composition
Macropod	A member of a super-family that includes kangaroos, rat-kangaroos and wallabies.
Mesic	Of, or adapted to, a temperate, moderately moist habitat.
Midden	A mound or deposit containing shells, animal bones, and other refuse that indicates the site of a human settlement.
Nature-based tourism	Tourism that is dependent upon the resources of the natural environment and incorporates a range of tourism experiences including adventure tourism, eco-tourism and aspects of cultural and rural tourism.
Obligate	Restricted to a single mode of behaviour or environmental condition, such as an obligate aerobe that is dependent on the presence of molecular oxygen to breathe.
Pathogen	A specific causative agent (as a bacterium or virus) of disease.
Pleistocene	The geological time period commencing about 2 million years ago and ending at the Holocene 10,000 years ago.
Priority Flora and Fauna Listings	Priority 1: Poorly known species. Species that are known from one or a few collections or sight records (generally less than 5), all on lands not managed for conservation and under threat of destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Priority 2 : Poorly known species Species that are known from one or a few collections or sight records (generally less than 5), some of which are on lands not under immediate threat of destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Priority 3: Poorly known species Species that are known from collections or sight records from several localities not under imminent threat, or from few widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Priority 4: Rare, Near Threatened and other species in need of monitoring. a. Rare. Species are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. b. Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependant, but that are close to qualifying for Vulnerable.

	c. Species that have been removed from the list of threatened species during the past 5 years for reasons other than taxonomy. Priority 5: Conservation dependant species Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within 5 years.
Quaternary	The present geological period commencing around 2 million years ago, includes the Pleistocene and recent Holocene time periods.
Recreation	Generally considered in this management plan to be the day-use of the parks and reserves by locals
Rehabilitation	The process necessary to return disturbed land to a predetermined state, in terms of surface, vegetation cover, land use and/or productivity.
Relict species	The existence of an archaic form in an otherwise extinct taxon.
Representative	In terms of a comprehensive, adequate and representative protected area reserve system; representative enough that the reserves reflect the biotic diversity of the ecosystems.
Safari camp	A term referring to a tented camp, either semi-permanent or permanent, offering a specific form of accommodation and experience.
Seral stage	A plant community that occurs at a particular stage of succession, which is the gradual change in the species composition of a community until it reaches a stable state composition if left undisturbed.
Soil erosion	A combination of processes in which soil is loosened, dissolved, or worn away, and transported from one place to another by climatic, biological or physical agents.
Spores	Primitive, usually unicellular, reproductive body produced by plants and some micro-organisms and capable of development into a new individual either directly or after fusion with another spore.
Statutory	Enacted or required by law.
Sustainability	An aspirational goal to meet the needs of current and future generations through integration of environmental protection, social advancement and economic prosperity.
Taxa (taxon)	A defined unit (for example, species or genus) in the classification of plants and animals.
Temperate	Of mild temperature, the Temperate Zone is the area or region between the tropic of Cancer and the arctic circle in the Northern Hemisphere or between the tropic of Capricorn and the Antarctic circle in the Southern Hemisphere
Tertiary	The geological period commencing around 65 million years ago and ending at the Quarternary period 2 million years ago includes five defined time periods.
Threatened ecological community	Threatened ecological communities are assessed by the Department and endorsed by the Minister of Environment. They are non-statutory (although some protection is afforded under the Acts of the Department of Environment and Department for Planning and Infrastructure) unless listed under the Commonwealth EPBC Act. There are four categories of threatened ecological communities: presumed totally destroyed, critically endangered, endangered (may be destroyed within 20 years) and vulnerable (may be destroyed within 50 years). As with flora, there are also possible threatened ecological communities that are allocated Priority 1 to 5 within the Department.
Threatened Fauna	Under the WA Wildlife Conservation Act, fauna may be declared as likely to become extinct, rare or otherwise in need of special protection: S1 – Fauna that is rare or likely to become extinct S2 – Fauna presumed extinct but might be rediscovered S3 – Birds protected under an international agreement S4 – Other specially protected fauna. Under the Commonwealth EPBC Act, fauna listed under Section 179 may be: EX – Extinct EW – Extinct in the wild CR – critically endangered EN – endangered VU – vulnerable CD – Conservation dependent Under IUCN Red List categories, fauna may be listed the same as under the EPBC Act.
Tourism	Generally considered in this management plan to be recreational activity undertaken by visitors who have travelled from outside the area and/or stay one night or more away

	from their usual place of residence (Department Policy Statement No. 18 – *Recreation, Tourism and Visitor Services*).
Tropical	A region or climate that is frost-free with temperatures high enough to support year-round plant growth given sufficient moisture, the Tropical Zone is the land between the tropic of Cancer and the tropic of Capricorn
Unclassified reserve	Classification under the Land Administration Act 1997 reflects security of tenure, level of approval required to alter the reserve's area, purpose or classification. Changes to unclassified reserves require Ministerial approval.
Understorey	The shrubs and plants that grow beneath the main canopy of a forest
Vector	Any agency responsible for the introduction or dispersal of an organism.
Vegetation complex	A combination of distinct site vegetation types, usually associated with a particular geomorphic, climatic, floristic and vegetation structural association.
Vertebrate	Animals that have a spinal column, which includes fish, amphibians, reptiles, birds and mammals.
Visual Landscape	Appearance or visual quality of an area determined by its geology, soils, landforms, vegetation, water features and land use history.
Wilderness	Is a region where the land is left in a state where human modifications are minimal and has not historically been significantly modified by direct or indirect human activity.

ACRONYMS

ARRP Act	Agricultural and Related Resources Protection Act
BOM	Bureau of Meteorology
BRM	Basic Raw Materials
CALM	Department of Conservation and Land Management
CAMBA	China Australia Migratory Bird Agreement
CAR	Comprehensive, adequate and representative protected area reserve system. Comprehensive enough that the full range of ecosystems recognised at an appropriate scale are reserved; adequate enough to maintain the ecological viability and integrity of populations, species and communities; and representative enough that the reserves reflect the biotic diversity of the ecosystems.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEC	Department of Environment and Conservation
DEW	Department of Environment and Water Resources (Federal)
DIA	Department of Indigenous Affairs
DMP	Department of Mines and Petroleum (formerly Department of Industry and Resources)
DoAF	Department of Agriculture and Food (formerly Department of Agriculture)
DoF	Department of Fisheries
DoW	Department of Water
DPI	Department of Planning and Infrastructure
DRF	Declared Rare Flora
EA	Environment Australia
EPA	Environment Protection Authority
EPBC Act	Environmental and Biodiversity Conservation Act
EWS	Environmental Weed Strategy for Western Australia
FESA	Fire and Emergency Services Authority
FNA	Fly Neighbourly Advice
FPC	Forest Products Commission
GDC	Gascoyne Development Commission
HWM	High Water Mark
IBRA	Interim Biogeographic Regionalisation for Australia
IMCRA	Interim Marine and Coastal Rationalisation for Australia
IUCN	International Union for the Conservation of Nature
JAMBA	Japan Australia Migratory Bird Agreement
KPI	Key Performance Indicator
LCU	Landscape Conservation Unit
LCT	Landscape Character Type
LWM	Low Water Mark
MOU	Memorandum of Understanding
MRWA	Main Roads Western Australia
NRM	Natural Resource Management
NRSP	National Reserve System Program
NWI	National Wilderness Inventory
NVIS	National Vegetation Information System
RATIS	Recreation and Tourism Information System
STCRC	Sustainable Tourism Cooperative Research Centre
TEC	Threatened Ecological Community
UCL	Unallocated Crown land
UMR	Un-Managed Reserve
ULCBP	Useless Loop Community Biosphere Project
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WAMM	Western Australian Maritime Museum
WAM	Western Australian Museum
WATSSC	Western Australian Threatened Species Scientific Committee

REFERENCES

Aguirre A.A. and Lutz P.L. 2004 Marine turtles as sentinels of ecosystem health: is fibropapillomatosis an indicator?, *EcoHealth*, 1, pp. 275-283.

Alford, J.J, Keighery, G.J. and Trudgen, M.E. 2000 *Vegetation and flora of the islands of the Freycinet Estuary, Shark Bay*, Department of Conservation and Land Management, Perth.

Aplin, K. and Kirkpatrick, P. 2001 In the pursuit of frog fungus, *Landscope*, 16(3) Autumn, 10-16, Department of Conservation and Land Management, Perth.

Asia-Pacific Shorebird Network (2007) http://www.shorebirdnetwork.org/news070207rokamba.html. Accessed 20 August 2007

ATA Environmental 2000 Environmental Assessment & Management Plan: Upgrade of Useless Loop Road, Gascoyne Region, Report No. 2000/142, Main Roads Western Australia, Perth.

Australia ICOMOS 1999 The Burra Charter: the Australia ICOMOS charter for the conservation of places of cultural significance, Australia ICOMOS Incorporated.

Australian Maritime Safety Authority 2000 Lighthouse Conservation Assessment: Cape Inscription Dirk Hartog Island Western Australia, AMSA, Canberra.

Australian Wildlife Conservancy 2002 *Annual Report, 2002*, Australian Wildlife Conservancy, West Perth.

Australian Wildlife Conservancy 2005 *Faure Island Sanctuary* http://www.australianwildlife.org/faureisland.asp. Accessed 27 March 2007.

Balazs G.H., Murakawa S.K.K., Ellis D.M., Aguirre A.A. 2000 Manifestation of fibropapillomatosis and rates of growth of green turtles at Kaneohe Bay in the Hawaiian Islands, In: F.A. Abreu-Grobois, R. Brisen˜o-Duen˜as, R. Ma´rquez & L. Sarti (editors), *Proceedings of the 18th Annual Symposium on Sea Turtle Biology and Conservation*, U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SEFSC-436, pp 112–113.

Bamford, M.J. (1992). The impact of fire and increasing time since fire on *Heleioporus eyrie, Lymnodynastes dorsalis* and *Myobatrachus gouldii* (Anura: Leptodactylidae) in *Banksia* woodlands near Perth, Western Australia. *Wildlife Research*, 19: 169-178.

Bamford, M.J. and Roberts, J.D. 2003 The impact of fire on frogs and reptiles in south-west Western Australia. In: Abbott & N.D. Burrows (Eds.) *Fire in ecosystems of the south-west of Western Australia: impacts and management*, Backhuys Publishers, Leiden, 349-361.

Baynes, A. 1990 The mammals of Shark Bay, Western Australia, In P.F Berry, S.D Bradshaw & B.R Wilson (eds) *Research in Shark Bay - Report of the France-Australe Bicentenary Expedition Committee*, pp. 313-325, Western Australian Museum, Perth.

Beard, J.S. 1976 *Vegetation Survey of Western Australia, Murchison*, University of Western Australia Press, Nedlands.

BOM 2007 *Climate Statistics for Australian Locations.* Retrieved on 19 April 2007 from Bureau of Meteorology,: http://www.bom.gov.au/climate/averages/tables/cw_006025.shtml

Bowdler, S. 1989 *An archaeological survey of Aboriginal sites in the area of Useless Loop, Shark Bay*, Report to Shark Bay Salt Pty Ltd.

Bowdler, S. 1990a Before Dirk Hartog: Prehistoric archaeological research in Shark Bay, Western Australia, *Australian Archaeology*, v 30, pp 46-57.

Bowdler, S. 1990b The Silver Dollar site, Shark Bay: an interim report, *Australian Aboriginal Studies*, no. 2, pp. 60-63.

Bowdler, S. 1990c, Archaeological research in the Shark Bay region, Western Australia: An introductory account, In P.F Berry, S.D Bradshaw & B.R Wilson (Eds.) *Research in Shark Bay - Report of the France-Australe Bicentenary Expedition Committee*, Western Australian Museum, Perth, pp. 1-12.

Bowdler, S. 1995 The excavation of two small rockshelters at Monkey Mia, Shark Bay, Western Australia, *Australian Archaeology*, no. 40, pp. 1-13.

Bowdler, S. 1999 Research at Shark Bay, W.A. and the nature of coastal adaptations in Australia, In: Jay Hall and Ian McNiven (eds) *Australian Coastal Archaeology*, pp. 79-84. ANH Publications, R.S.P.A.S., Australian National University, Canberra.

Braithwaite R. W., 1987. Effects of fire regimes on lizards in the wet-dry tropics of Australia, *Journal of Tropical Ecology* 3, 265 275.

Brown, P.H. 2001 Eradication of Domestic Stock and Feral Goats on Peron Peninsula, Shark Bay: 10 Years On (1990-2000), internal report, Department of Conservation and Land Management, Perth.

Burbidge, A.A. and George, A.S. 1978 The flora and fauna of Dirk Hartog Island, Western Australia, *Journal of the Royal Society of Western Australia*, 61: 71-90.

Burbidge, A. A and Johnson, P. M. (1983). Rufous hare-wallaby *Lagorchestes hirsutus*. In *The Australian Museum Complete Book of Australian Mammals.* Ed R. Strahan, Angus & Robertson, Sydney.

Burbidge, A. A. 1985 Fire and mammals in hummock grasslands of the arid zone. In: J.R. Ford (Ed.) *Fire Ecology and Management in Western Australian Ecosystems*, Western Australian Institute of Technology, Environmental Studies Group Report No. 14.

Burbidge, A.A. and McKenzie, N.L. 1989 Patterns in the modern decline of Western Australia's vertebrate fauna: causes and conservation implications. *Biological Conservation* 50: 143-198.

Burbidge AH, Johnstone JE, Fuller PJ, Stone P 2000. Terrestrial birds of the southern Carnarvon Basin, Western Australia: contemporary patterns of occurrence. *Records of the Western Australian Museum Supplement* 61: 449-464

Burbidge, A.H. 2003 Birds and fire in the Mediterranean climate of south-west Western Australia, In: I. Abbott & N.D. Burrows (Eds.) *Fire in ecosystems of the south-west of Western Australia: impacts and management*, Backhuys Publishers, Leiden, 321-347.

Burbidge, A.A. 2004 *Threatened Animals of Western Australia*, Department of Conservation and Land Management, Perth.

Burrows, N.D. and Christensen, P.E.S. 1991 A survey of Aboriginal fire patterns in the Western Desert of Australia, In: S.C. Nodvin and T.A. Waldrop (Eds.) *Fire and the Environment: ecological and cultural perspectives: proceedings from an international symposium*, Knoxville, Tennessee, March 20-24 1990.

Burrows, N., Ward, B. and Robinson, A. 1991 Fire behaviour in spinifex fuels on the Gibson Desert Nature Reserve, Western Australia, *Journal of Arid Environments*, 20:189-204.

Burrows, N.D. and Friend, G. 1998 Biological indicators of appropriate fire regimes in south west Australian ecosystems, In T. Pruden and L. Brennan (Eds.) *Fire in ecosystem management: shifting the paradigm from suppression to prescription*, Tall Timbers Fire Ecology Conference Proceedings, No. 20, Tall Timbers Research Station, Tallahasse.

Burrows, N.D., Ward, B. and Robinson, A.D. 1999 *The role of indicators in developing appropriate fire regimes*, Proceedings from the Australian Bush Fire Conference, 7-9 July 1999, Albury, Australia.

Burrows N.D., Burbidge, A.A., and Fuller, P.J. 2000 *Nyaruninpa: Pintupi Burning in the Australian Western Desert*, Department of Conservation and Land Management, Perth.

Burrows, N. and Wardell-Johnson, G. 2003 Fire and plant interactions in forested ecosystems of south-west Western Australia, In: I. Abbott & N.D. Burrows, (Eds.) *Fire in ecosystems of the south-west of Western Australia: impacts and management*, Backhuys Publishers, Leiden: 225-268.

Burrows, N.D. 2004a *Fire management strategies for a south west Australian biodiversity hotspot*, TNC, WWF, IUCN Global Fire Partnership Experts Workshop, Sigrisvil, Switzerland, 15-18 May 2004, Department of Conservation and Land Management, Perth.

Burrows, N.D. 2004b Draft Guiding Principles for Fire Management in Spinifex Grasslands of Western Australia. Internal Workshop, Department of Conservation and Land Management, Perth.

Burrows, N.D 2005. Active Adaptive Management: enhancing the integration of science and management to improve delivery of conservation and land management outcomes. Internal discussion paper, Department of Conservation and Land Management Library.

Burrows, N.D., Ward, B.G., Robinson, A.D. and Behn, G. 2006. Fuel dynamics and fire behaviour in spinifex grasslands of the Western Desert. Bushfire Conference 2006: Life in a Fire-Prone Environment: Translating Science inti Practice. Brisbane 6-9 June 2006.

Burrows, N.D. (in press) Approaches to fire management for biodiversity conservation in south-west Australian forest landscapes, *Forest Ecology and Management*.

Bushfire Cooperative Research Centre and Australasian Fire Authorities Council 2006 *Fire Note: Climate Change and its Impact on the Management of Bushfire.* Bushfire CRC Ltd, East Melbourne.

Butcher, B.P., van der Graff, W.J.E. and Hocking, R.M. 1984 *Shark Bay-Edel Western Australia*, Geological Survey of Western Australia, 1:250,000 explanatory notes, Perth.

CALM 1986a Policy Statement No. 10 – *Rehabilitation of disturbed land*, Department of Conservation and Land Management, Perth.

CALM 1986c Policy Statement No. 14 – *Weeds on CALM Lands*. Department of Conservation and Land Management, Perth.

CALM 1988 Policy Statement No. 25 – *Community education and interpretation.* Department of Conservation and Land Management, Perth.

CALM 1989 Policy Statement No. 34 – *Visual resource management of lands and waters managed by CALM*. Department of Conservation and Land Management, Perth.

CALM 1990a Policy Statement No. 31 – *Management of reserves for the conservation of nature*, Department of Conservation and Land Management, Perth.

CALM 1990b *Guidelines for the Management and Rehabilitation of Gravel Pits*, Department of Conservation and Land Management, Perth.

CALM 1991 Policy Statement No. 33 – *Conservation of Threatened and Specially Protected Fauna in the Wild*, Department of Conservation and Land Management, Perth.

CALM 1992 Policy Statement No. 9 – *Conserving threatened species and ecological communities* (subject to final consultation). Department of Conservation and Land Management, Perth.

CALM 1993 Policy Statement No. 51 – *Access for Commercial Fishing through CALM Lands*, Department of Conservation and Land Management, Perth.

CALM 1994a Policy Statement No. 50 – *Setting Priorities for Conservation of Western Australia's Threatened Flora and Fauna*, Department of Conservation and Land Management, Perth.

CALM 1994b *Reading the Remote: Landscape Characters of Western Australia*, Department of Conservation and Land Management, Perth.

CALM 1995 Policy Statement No. 29 – *Translocation of threatened flora and fauna*, Department of Conservation and Land Management, Perth.

CALM 1996a Policy Statement No. 54 – *Defence force training on CALM managed lands and waters*, Department of Conservation and Land Management, Perth.

CALM 1996b *Shark Bay Marine Reserves Management Plan 1996-2006*, Department of Conservation and Land Management, Perth.

CALM 1997 Policy Statement No. 53 – *Visitor Risk Management*, Department of Conservation and Land Management, Perth.

CALM and EA 1997, Agreement between the State of Western Australia and the Commonwealth of Australia on Administrative Arrangements for the Shark Bay World Heritage Property in Western Australia, CALM and EA.

CALM 1999a *Environmental Weed Strategy for Western Australia*, Department of Conservation and Land Management, Perth.

CALM 1999b *Tour Operators Handbook*, Department of Conservation and Land Management, Perth.

CALM 2000 *Shark Bay Terrestrial Reserves Management Plan 2000-2009*, Management Plan No. 45, Department of Conservation and Land Management, Perth.

CALM 2001 *Shark Bay World Heritage Property Landscape Study: Managing Community Enjoyment, Recreation, Tourism and Development*, Department of Conservation and Land Management, Perth.

CALM 2002 *Workshop on disease in Western Barred Bandicoot population*s, Internal report, Department of Conservation and Land Management, Perth.

CALM 2003 *Establishment of a Comprehensive, Adequate and Representative Terrestrial Conservation Reserve System in Western Australia*, Department of Conservation and Land Management, Perth.

CALM 2004 Policy Statement 62 – *Identification and Management of Wilderness and Surrounding Areas*, Department of Conservation and Land Management, Perth.

CALM 2005a Administrative Instruction No. 67 – *Minimising Disease Risk in Wildlife Management Standard Operating Procedures*, Department of Conservation and Land Management, Perth.

CALM 2005b Policy Statement No. 19 – *Fire management*, Department of Conservation and Land Management, Perth.

CALM 2005c *Cape Range National Park Draft Management Plan.* Department of Conservation and Land Management, Kensington

CALM 2006a *Lands and waters managed by the Department of Conservation and Land Management*, Department of Conservation and Land Management, Perth.

CALM 2006c draft *Shark Bay World Heritage Property Visitor Plan*, internal document, Department of Conservation and Land Management, Perth.

CALM Draft Policy Statement No. 9 – *Conserving threatened species and ecological communities* (subject to final consultation), Department of Conservation and Land Management, Perth.

CALM *Draft Policy Management of Pest Animals on CALM-managed lands* (subject to final consultation), Department of Conservation and Land Management, Perth.

CALM *Draft Policy Environmental Weed Management* (subject to final consultation), Department of Conservation and Land Management, Perth.

CALM & DPI 2004 *Memorandum of Understanding in relation to Title Administration and Management of Unallocated Crown Land and Unmanaged Reserves outside the Metropolitan area, Regional Centres and Townsites*, Department of Conservation and Land Management & Department for Planning and Infrastructure, Perth.

CALM & DPI 2004 *Memorandum of Understanding in relation to Acquisition and Management of Pastoral Leases for the Conservation Reserve System*, Department of Conservation and Land Management & Department for Planning and Infrastructure, Perth.

CALM & DoF 2005 *Memorandum of Understanding to Establish Principles of Cooperation and Integration*, Department of Conservation and Land Management & Department of Fisheries, Perth.

Carmody, R.W. 1970 *Shark Bay – its story 1616-1969*, Thesis for Teachers Higher Certificate for the Education Department of Western Australia.

CCWA 2006 Policy Statement No. 3 – *Basic raw materials: government and local government access to conservation estate (national parks, nature reserves and conservation parks*), Conservation Commission of Western Australia, Perth.

Chapman, K. 2002, *Shark Bay World Heritage Area: Communication Strategy 2003-2006*, Department of Conservation and Land Management, Perth.

Chapman, K. 2003a, *World Heritage Communications & Interpretive Planning: Stakeholder Discussion Document*, Department of Conservation and Land Management, Perth.

Chapman, K. 2003b *Shark Bay World Heritage Area Interpretation Action Plan*, Department of Conservation and Land Management, Perth.

Clark, R. N. and Stankey, G. H. 1979 *Determining the acceptability of recreation impacts, an application of the outdoor recreation opportunity spectrum*, Recreational Impact on Wildlands Conference Proceedings: 32-42, US Department of Agriculture, Portland, Oregon.

Claymore, S.J. and Markey, A.J. 1999 *A floristic survey of the Shark Bay World Heritage Area: An interim report on surveys of Peron Peninsula, Edel Land, Bernier Island and Dorre Island*, Department of Conservation and Land Management, Perth.

Commonwealth of Australia 1999 *Environmental Protection and Biodiversity Conservation Act*, Commonwealth of Australia, Canberra

Cooper, D. 1997 *A Brief History on the Military Influences in Shark Bay, Western Australia*, Report No. 122, Department of Maritime Archaeology, Western Australian Maritime Museum.

Cooper, R. 1997 *Shark Bay Legends*, Rawlhouse Publishing Pty Ltd, Perth.

Cornell, C. (trans. & ed.) 1974 *The Journal of Post Captain Nicholas Baudin*, Libraries Board of South Australia, Adelaide.

CSIRO (2007) *Climate Change in Australia*. Commonwealth Scientific and Industrial Research Organisation and Bureau of Meteorology. Australia. Technical Report 2007.

Curry, S.S., D.R. Brown, J.M. Gaskin, E.R. Jacobson, L.M. Ehrhart, S. Blahak, S. Hirama, L.H. Herbst, and P.A. Klein. 2000 Persistent infectivity of a disease-associated herpesvirus in green turtles after exposure to seawater, *Journal of Wildlife Disease*, 36(4), pp. 792-797.

David, A. 1995 *The Voyage of HMS Herald*, Melbourne University Press, Melbourne.

DEC and Track Care WA 2006 *Memorandum of Understanding between Track Care Western Australia Inc, the West Australian Four Wheel Drive Association Inc and the Department of Environment and Conservation*, Department of Environment and Conservation & Track Care Western Australia Inc, Perth.

DEC 2006a. *Draft Nature Conservation Service Midwest Region Plan 2006-2009.* Department of Environment and Conservation, Geraldton.

DEC 2006b Policy Statement No. 18 – *Recreation, tourism and visitor services*, Department of Environment and Conservation, Perth.

DEC 2006c Draft – *A 100-Year Biodiversity Conservation Strategy for Western Australia: Blueprint to the Bicentenary in 2029*, Government of Western Australia, Kensington.

DEC 2007 *Good Neighbour Policy*. Department of Environment and Conservation, Perth

DEC 2008a *Shark Bay World Heritage Property Strategic Plan 2008-2020*, Department of Environment and Conservation, Perth.

DEC 2006b *Tour Operator Handbook - Terrestrial*, Department of Environment and Conservation, Perth.

DEH 2002 *Chytridiomycosis due to the amphibian chytrid fungus* – advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee on Amendments to the List of Key Threatening Processes under the Environment Protection and Biodiversity Conservation Act 1999, Department of the Environment and Heritage, Canberra.

DEH 2003 *National Vegetation Attribute Manual Version 6.0*, Retrieved 20 May 2006 from: http://www.deh.gov.au/erin/nvis/publications/avam/index.html

DEH 2004 *National Biodiversity and Climate Change Action Plan 2004-2007*, Department of the Environment and Heritage, Canberra, Retrieved 15 February 2005 from: http://www.deh.gov.au/biodiversity/publications/nbccap .

DEWHA 2008a *Threat abatement plan for predation by the European fox*, Department of the Environment, Water, Heritage and the Arts, Canberra.

DEWHA 2008b *Threat abatement plan for predation by feral cats*, Department of the Environment, Water, Heritage and the Arts, Canberra.

DEWHA 2008c *Threat abatement plan for competition and land degradation by unmanaged goats*, Department of the Environment, Water, Heritage and the Arts, Canberra.

DEWHA 2008d *Threat abatement plan for competition and land degradation by rabbits*, Department of the Environment, Water, Heritage and the Arts, Canberra.

DIA 2005 The Department of Indigenous Affairs Heritage database, Retrieved 25 May 2005 from http://www.dia.wa.gov.au/heritage/inquiry Department of Indigenous Affairs, Perth.

Dixon, I.R., Dixon K.W. and Barrett, M. 2001 Eradication of buffel grass (*Cenchrus cilaris*) on Airlie Island, Pilbara coast, Western Australia. In C.R. Veitch and M.N. Clout (eds.) *Turning the Tide in the Eradication of Invasive Species*. Pp 92-101 IUCN SSC Invasive Species Specialist Group, IUCN, Gland, Switzerland and Cambridge, UK.

DME 1998 *Guidelines for Mineral Exploration and Mining within Conservation Reserves and other Environmentally Sensitive Areas*, Department of Minerals and Energy, Perth.

DoA 2001 *State Weed Plan*, Department of Agriculture, Perth.

DoE 2004 *Carnarvon Artesian Basin Rehabilitation Projec*t, Internal report, Department of Environment, Perth.

DoF 1996 *Shark Bay World Heritage Property: Management Paper for Fish Resources No. 91*, Department of Fisheries, Perth.

DoF 2002 *Fisheries Environmental Management Plan for the Gascoyne Region*, Fisheries Management Paper No. 142, Department of Fisheries, Perth.

DoF 2002 *Draft Bycatch Action Plan for the Shark Bay Prawn Managed Fishery*, Fisheries Management Paper No. 147, Department of Fisheries, Perth.

DoF 2004 *Draft Aquaculture Plan for Shark Bay*, Fisheries Management Paper No. 171 Department of Fisheries, Perth.

DoF 2005 *Proposed Management Arrangements for the Gascoyne Commercial 'Wetline' Fishery*, Fisheries Management Paper No. 189, Department of Fisheries, Perth.

DoIR 2005 *WA Mineral and Petroleum Statistics Digest*, Department of Industry and Resources, Perth.

DPI 2005 *The 2015 Exclusion Process*. http://www.dpi.wa.gov.au/pastoral/process.html

Edwards, H. 1999 *Shark Bay Through Four Centuries 1616 to 2000: A World Heritage Area*, Scott Four Color Print, Perth.

EA 1999a *Australia's Guidelines for Establishing the National Reserve System*, Environment Australia, Canberra.

EPA 1976 *Conservation Reserves for Western Australia, Red Book: Systems 4, 8, 9, 10, 11, 12*, Environmental Protection Authority, Perth.

EPA 2000 *Guidance Statement for Assessment of Development Proposals in Shark Bay World Heritage Property No. 49*, Environmental Protection Authority, Perth.

EPA 2003 *A Strategic Assessment of the Compatibility of Petroleum Industry Activities with the Environmental Values and Cultural Uses of the Shark Bay World Heritage Property: Section 16(e) report and recommendations of the EPA*, Environmental Protection Authority, Perth.

EPA 2006 *Environmental Offsets*, Position Statement No. 9, Environmental Protection Authority, Perth.

Fletcher, W.J. and Head, F. (eds). 2006. *State of the Fisheries Report 2005/06*, Department of Fisheries, Western Australia.

Friend, G. 1995 Fire and invertebrates : a review of research methodology and the predictability of post-fire response patterns, In: W.L. McCaw, N.D. Burrows, G.R. Friend & A.M. Gill (Eds) *Landscape fires '93: proceedings of an Australian bushfire conference*, CALMScience Supplement No. 4, Department of Conservation and Land Management, Perth, 165-174.

Friend, G. 1999 Fire and faunal response patterns: a summary of research findings, In: G. Friend, M. Leonard, A. MacLean & I. Sieler (Eds) *Management of fire for the conservation of biodiversity: workshop proceedings*, Fire Ecology Working Group, Department of Natural Resources and Environment, Victoria.

Friend, G. and Wayne, A. 2003 Relationships between mammals and fire in south-west West Australian ecosystems: what we know and what we need to know, In: I. Abbott & N.D. Burrows (Eds.) *Fire in ecosystems of the south-west of Western Australia: impacts and management*, Backhuys Publishers, Leiden, 363-380.

Fry, R. 1995a *The Report of an Aboriginal Heritage Study of the Shark Bay Region Study Area*, Western Australia, Draft, April 1995, WA Planning Commission, Perth.

Fry, G.W. 1995b *Shark Bay Days*, Hesperian Press, Perth.

Gibson, N, Burbidge, A.H., Keighery, G.J and Lyons, M.N. 2000 The temperate to arid transition of Irwon-Carnarvon phytogeographic boundary, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 155-174.

Government of Western Australia 2003 *Indigenous ownership and joint management of conservation lands in Western Australia*. Consultation Paper, Government of Western Australia.

Gray, L. & Forgione, L. 2004 Conservation Management Plan: Cape Inscription Lighthouse Keepers Quarters, Dirk Hartog Island, Shark Bay, Prepared for Shire of Shark Bay.

Green, R., Higginbottom. K. and Northrope, C. 2001 *A Tourism Classification for Australian Wildlife,* Wildlife Tourism Research Report Series No. 7, CRC for Sustainable Tourism Pty Ltd, National Library of Australia, Canberra.

Green, J., Anderson, R., Carpenter, J., Cooper, D., Ford, A., McCarthy, M. and Stanbury, M. (2007) Report on the 2006 Western Australian Museum, Department of Maritime Archaeology, Cape Inscription National heritage Listing Archaeology Survey, Western Australian Museum, Perth.

Grey, G 1841 *Journals of two expeditions of discovery in north-west and western Australia during the years 1837, 38 and 39*, T & W Boone, London.

Griffin, G. F., Price, N. F. and Portlock, H. F. 1983 Wildfires in the central Australian rangelands, *Journal of Environmental Management*, 17: 311-323.

Griffiths AD, 1994. The Effects of Seasonal Variation and Fire on the Population Ecology of Frillneck Lizards, *Chlamydosaurus kingii*, in the Wet-Dry Tropics of Australia, MSc Thesis, Northern Territory University, Darwin.

Halse, S.A., Shiel, R.J., Storey, A.W., Edwards, D.H.D, Lansbury, I, Cale, D.J. & Harvey, M.S. 2000 Aquatic invertebrates and waterbirds of the wetlands and rivers of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 217-265.

Harvey, M.S., Sampey, A., West, P.L.J. & Waldock, J.M. 2000a Araneomorph spiders for the southern Carnarvon Basin, Western Australia: A consideration of regional biogeographic relationships, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 295-321.

Harvey, M.S., Sampey, A., West P.L.J. & Waldock, J.M. 2000b The Chilopoda and Diplopoda of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 323-333.

Haynes, C.D. 1991 Use and impacts of fire, In: C.D. Haynes, M.G. Ridpath & M.A.J. Williams (Eds.) *Monsoonal Australia: landscape, ecology and man in the northern lowlands*, Balkema, Rotterdam.

Higginbottom, K, Rann, K, Moscardo, G., Davis, D. and Muloin, S. (2001a) Wildlife Tourism Research Report No. 1, Status Assessment of Wildlife Tourism in Australia Series, *Wildlife Tourism in Australia: an overview*, CRC for Sustainable Tourism, Gold Coast, Queensland.

Higginbottom, K., Northrope, C.L. and Green, R. 2001b Wildlife Tourism Research Report No. 6, Status Assessment of Wildlife Tourism in Australia Series, *Positive Effects of Wildlife Tourism on Wildlife and Habitats*, CRC for Sustainable Tourism, Gold Coast, Queensland.

Hocking, R.M., Moors, H.T. Van de Graaff, W.J.E. and Geological Survey of Western Australia 1987 *Geology of the Carnarvon Basin Bulletin (Geological Survey of Western Australia).* Department of Mines, Perth.

Howden, M., Hughes, L., Dunlop, M., Zethoven, I., Hilbert, D., and Chilcott, C. 2003 *Climate Change Impacts on Biobiversity in Australia*, Outcomes of a workshop sponsored by the Biological Diversity Advisory Committee, 1-2 October, Commonwealth of Australia, Canberra.

Hughes 2003 Climate change and Australia: Trends, projections and impacts. *Austral Ecology* 28: 423-443.

Johnstone, R.E., Burbidge, A.H. & Stone, P. 2000 Birds of the southern Carnarvon Basin, Western Australia: Distribution, status and historical changes, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 371-448.

Kanowski, P.J., Cork, S.J., Lamb, D. and Dudley, N. 2001 Assessing success of off-reserve forest management in contributing to biodiversity conservation, In: R.J. Raison, A.G. Brown and D.W. Flinn (eds) *Criteria and indicators for sustainable forest management*, IUFRO 7 Research Series, CABI Publishing, United Kingdom.

Keighery, G.J., Gibson., N., Lyons, M.N. & Burbidge, A.H. 2000 Flora and vegetation of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 77-154.

Keighery G.J. and Longman, V. 2004 The naturalised vascular plants of Western Australia. 1: Checklist, environmental weeds and distribution in IBRA regions, vol. 19, no. 1, Plant Protection Quarterly, Melbourne.

King, P.P. 1827 *Narrative of a survey of the intertropical and western coasts of Australia: performed between the years 1818 and 1822*, John Murray, London.

Landsberg J.H., Balazs G.H., Steidinger K.A., Baden D.G., Work T.H. and Russel D.J. 1999 The potential role of natural tumor promoters in marine turtle fibropapillomatosis, *Journal of Aquatic Animal Health*, 11, pp.199–210.

Latz, P. 1994 Fire in the desert: Increasing biodiversity in the short term, decreasing it in the long term, In: R.D. Bird (Ed.), *Country in flames*, Proceedings of the 1994 symposium on biodiversity and fire in North Australia, Biodiversity Unit, Department of the Environment, Sport and Territories and North Australia Research Unit, The Australian National University, Canberra and Darwin.

Lefroy, GC 1978 *The Shark Bay Story*, Western Australian Museum, Perth.

Lundie-Jenkins, G 1993. Ecology of the rufous hare-wallaby, *Lagorchestes hirsutus* Gould (Marsupialia: Macropodidae) in the Tanami desert, Northern Territory. I. Patterns of habitat use. *Wildlife Research* 20: 457-476.

Lundie-Jenkins, G, Phillips, C.M and Jarman, P.J. 1983. Ecology of the rufous hare-wallaby, *Lagorchestes hirsutus* Gould (Marsupialia: Macropodidae) in the Tanami desert, Northern Territory. II Diet and feeding strategy. *Wildlife Research* 20: 477-494.

Main, B.Y, Sampey, A., & West, P.L.J. 2000 Mygalomorph spiders of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 281-293.

Maller, C., Townsend, M., Brown, P. and St Leger, L. 2002 *Healthy Parks Healthy People: The health benefits of contact with nature in a park context*, A review of current literature, Occasional Paper Series Volume One, Report to Parks Victoria and the International Park Strategic Partners Group, Deakin University and Parks Victoria.

Marchant, L.R. 1982 *France Australe*, Artlook Books, Perth.

Masters, P. 1993. The effects of wind-driven succession and rainfall on small mammals in spinifex grassland at Uluru National Park, Northern Territory. *Wildlife Research* 20: 803-813.

Mattiske Consulting Pty. Ltd 1996 *Flora and Vegetation, Useless Loop, Shark Bay*, Mattiske Consulting Pty. Ltd., Perth.

May, J.E. & McKenzie, N.L. (Eds.) 2003 *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*, Department of Conservation and Land Management, Perth.

McCarthy, M. *The Zuytdorp Story*, WA Museum, Perth.

McGann, S. 2000 Report on a survey for archaeological sites on the Kalbarri to Steep Point link route, Main Roads of Western Australia, Perth.

McKenzie, N.L., Hall, N. & Muir, M.P. 2000a Non-volant mammals of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 79-510.

McKenzie, N.L., Rolfe, J.K., Aplin, K.P., Cowan, M,A. & Smith, L.A. 2000b Herpetofauna of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 335-360.

McKenzie, N.L., Keighery, G.J., Gibson, N. & Rolfe, J.K. 2000c Patterns in the biodiversity of terrestrial environments in the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 511-546.

McKenzie, N.L., Halse, S.A & Gibson, N. 2000d Some gaps in the reserve system of the southern Carnarvon Basin, Western Australia, In: A.H. Burbidge, M.S. Harvey & N.L. McKenzie (eds) *Biodiversity of the southern Carnarvon Basin*, Records of the Western Australian Museum Supplement No. 61, pp. 547-568.

Morse, K. 1988 An archaeological survey of midden sites near the Zuytdorp wreck, Western Australia, *Bulletin of the Australian Institute for Maritime Archaeology*, 12:37-40.

MRWA 1997 Roads 2020 Regional Road Development Strategy – Midwest, Main Roads Western Australia, Perth.

Natural Resource Management Ministerial Council (2004). Directions for the National Reserve System – A Partnership Approach. Australian Government, Department of Environment and Heritage, Canberra.

Nicholson, P.H. 1981 Fire and the Australian Aborigine – an enigma. In: A.M. Gill, R.H. Groves & I.R. Noble (Eds.) *Fire and the Australian Biota*, Australian Academy of Science, Canberra.

Palassis Architects 1996 *Conservation Management Plan for Cape Inscription Lighthouse Keepers Quarters,* for the National Trust of Australia (WA), (HCWA ID No 6911).

Payne, A.L., Curry, P.J. & Spencer, G.F. 1987 *An inventory and condition survey of the rangelands in the Carnarvon Basin, Western Australia,* Technical Bulletin No. 73, Pastoral Lands Board, Perth.

Peron M.F. (trans) 1809 *A voyage of discovery to the southern hemisphere, performed by order of the Emperor Napoleon during the years 1801, 1802, 1803 and 1804*, (translated) B. McMillan, London.

Playford, P.E. 1990 Geology of the Shark Bay area, Western Australia, In: P.F Berry, S.D Bradshaw & B.R Wilson (eds) *Research in Shark Bay - Report of the France-Australe Bicentenary Expedition Committee*, pp. 13-31, Western Australian Museum, Perth.

Playford, P. 1998 *Voyage of Discovery to Terra Australis by Willem de Vlamingh in 1696-97,*

Prosser, G. 1986 The Limits of Acceptable Change: An Introduction to a Framework for Natural Area Planning, Australia Parks and Recreation, Summer.

Pyne, S.J. 1991 *Burning bush: a fire history of Australia*, Henry Holt and Company, New York.

Recher, H.F., Allen, D and Gowing, G, 1985. The impact of wildfire on birds in an intensively logged firest. In: *Birds of Eucalypt Forests and Woodlands*. Eds. A. Keast, H.Recher, H. Ford, and D Saunders. Surrey Beatty & Sons Pty. Ltd, Chipping Norton.

Ride, W.D.L. 1962 Introduction In: A.J. Fraser The Results of an Expedition to Bernier and Dorre Islands, Shark Bay, Western Australia in July 1959, Department of Fisheries & Wildlife, Perth.

Riviere, M.S. 1996 (translated & ed) *A Woman of Courage: The journal of Rose de Freycinet on her voyage around the world 1817 – 1820*, National Library of Australia, Canberra.

Robert, W.C.H. 1972 *The Explorations, 1696-1697, of Australia by Willem De Vlamingh*, Philo Press, Amsterdam.

Royce, R.D. 1962 Botany In: A.J. Fraser The Results of an Expedition to Bernier and Dorre Islands, Shark Bay, Western Australia in July 1959, Department of Fisheries & Wildlife, Perth.

Shire of Shark Bay 2001 *Hamelin Pool Common Management Plan*, Shire of Shark Bay, Denham.

Shire of Shark Bay 2006. *Town Planning Scheme No.3*, Government of WA, Perth.

Short, J. Bradshaw, S.D., Giles, J., Prince, R.I.T. & Wilson, G.R. 1992 Reintroduction of macropods (Marsupialia: Macropodidae) in Australia: A review, *Biological Conservation* **17**: 243-267.

Sims, C. 2006 *Project Eden Strategic Plan 2006-2010*, Internal document, Department of Conservation and Land Management, Perth.

Spencer, J. (Ed.) 1981 *A Voyage of New Holland: The English Voyage of Discovery to the South Seas in 1699 by William Dampier*, Alan Sutton, London.

Stanbury, M. 1986, *Historic sites in Shark Bay*, Paper presented at the Shark Bay Seminar, Kingswood College, University of Western Australia, 15 April 1986, Department of Maritime Archaeology, Western Australian Museum, Fremantle.

Standards Australia 2001 *Standards for Walk Tracks*, Standards Australia, Canberra.

State of Western Australia 1997 *Roads 2020 Regional Road Development Strategy – Gascoyne.* Main Roads Western Australia, East Perth.

State Planning Commission 1988 *Shark Bay Region Plan*, State Planning Commission, Perth

Storr 1990 Birds of the Shark Bay area, Western Australia, In: P.F Berry, S.D Bradshaw & B.R Wilson (eds) *Research in Shark Bay - Report of the France-Australe Bicentenary Expedition Committee*, pp.299-132, Western Australian Museum, Perth.

Storr, G.M. and Harold, G. 1990 Amphibians and reptiles of the Shark Bay area, Western Australia, In: P.F Berry, S.D Bradshaw & B.R Wilson (eds) *Research in Shark Bay - Report of the France-Australe Bicentenary Expedition Committee*, pp.279-282, Western Australian Museum, Perth.

Suba, T. 1995 Peron Homestead and station precinct in the Francois Peron National Park, Shark Bay World Heritage Area, Department of Conservation and Land Management, Perth.

Summer, N.R., Williamson, P.C. & Malseed, B.E. 2002, *A 12-month survey of recreational fishing in the Gascoyne bioregion of Western Australia during 1998-99*, Fisheries Research report No. 139, Department of Fisheries, Perth.

Tindale 1974 Aboriginal Tribes of Australia: Their terrain, environmental controls, distribution, limits and proper names, Australian National University Press, Canberra

Townsend, D.B. 1996 *Basic Raw Materials of the Shark Bay World Heritage Area*, Geological Survey of Western Australia, Perth.

Tropical Savannas CRC 1997 *Impact of Aboriginal burning*, In: *Savanna Links*, 4 Website www.savanna.ntu.edu.au/publications/savanna_links4/aboriginal_burning.html

Trainor, C.R and Woinarski J.C.Z 1994. Response of lizards to three experimental fires in the savannah forests of Kakadu National Park. *Wildlife Research* 21: 131-148.

Trudgen, M.E. and Keighery, G.J. 1995 *Flora of the Shark Bay World Heritage Area and Environs*, Unpublished report for the Australian Heritage Commission, CALM, Wanneroo.

Tu, M. 2002 *Element Stewardship Abstract for Cenchrus ciliaris L.*, The Nature Conservancy's Wildland Invasive Species Team, Department of Vegetable Crops and Weed Sciences, University of California.

TWA 2003 *Pathways Forward: Strategic Plan 2003-2008*, Tourism Western Australia, Perth.

TWA 2004 Australia's Coral Coast Destination Development Strategy: An action approach, Tourism Western Australia, Perth.

TWA 2006 *Shire of Shark Bay Fact Sheet 2005*, Tourism Western Australia, Perth.

Tyler, M.J., Smith, L.A., & Johnstone, R.E. 2000 *Frogs of Western Australia*, Western Australian Museum, Perth.

UNESCO 2007 UNESCO's *Man and Biosphere Programme (MAB)* http://www.unesco.org/mab/mabProg.shtml Accessed 27 March 2007.

URS 2000 Shark Bay World Heritage Property: Draft working paper on environmental values cultural uses and petroleum industry impacts, Prepared for the Environmental Protection Authority and Environment Australia, URS, East Perth.

WA Government 1950 *Wildlife Conservation Act*, Government of Western Australia, Perth.

WA Government 1954 *Bush Fires Act*, Government of Western Australia, Perth.

WA Government 1984 *Conservation and Land Management Act*, Government of Western Australia, Perth.

WA Government *State Gravel Supply Strategy*, Government of Western Australia, Perth.

WA Government 2003a Indigenous ownership and joint management of conservation lands in Western Australia, Consultation Paper, Government of Western Australia, Perth.

WA Government 2003b Hope for the Future: The Western Australian State Sustainability Strategy, Department of Premier and Cabinet, Perth.

WA Government 2005 Memorandum of Understanding between Minister for Environment and Minister for Fisheries: Establish Principles of cooperation and integration between the Department of Conservation and Land Management and Department of Fisheries in the management of the State's marine protected areas, Department of Conservation and Land Management & Department of Fisheries, Perth.

WA Government 2006 *State of the Environment Report Western Australia draft*, Environment Protection Authority, Perth.

WA Herbarium 2005 The Western Australian Herbarium database.

WA Museum 2003 The Western Australian FaunaBase website, Retrieved 19 May 2005 from: http://www.museum.wa.gov.au/faunabase/prod/index.htm

WA Museum 2005 Correspondence, West Australian Maritime Museum, Perth.

WA Planning Commission 1997 *Shark Bay Regional Strategy*, Western Australian Planning Commission, Perth.

WA Planning Commission and DPI 2008 *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design*, State Government of WA, Perth.

WATA and CALM 1997 *Nature based tourism strategy for Western Australia*, Western Australian Tourism Commission, Perth.

Wildlife Research and Management Pty. Ltd. 2005. *Conservation of Threatened Mammals at Shark Bay*. http://www.wildliferesearchmanagement.com.au/hpindex.htm Accessed 27 March 2007

Williams, A.A.J., Karoly, D.J. and Tapper, N. (2001) The sensitivity of Australian fire danger to climate change. *Climatic Change* 49: 171-191.

Wills, R. & Dogramaci, S 2000 *Carnarvon Basin, Hydrogeology and Hydrochemistry of the Confined Groundwater Systems, Western Australia*, Hydrogeology Report No. 170, unpbl report, Waters & Rivers Commission, Perth.

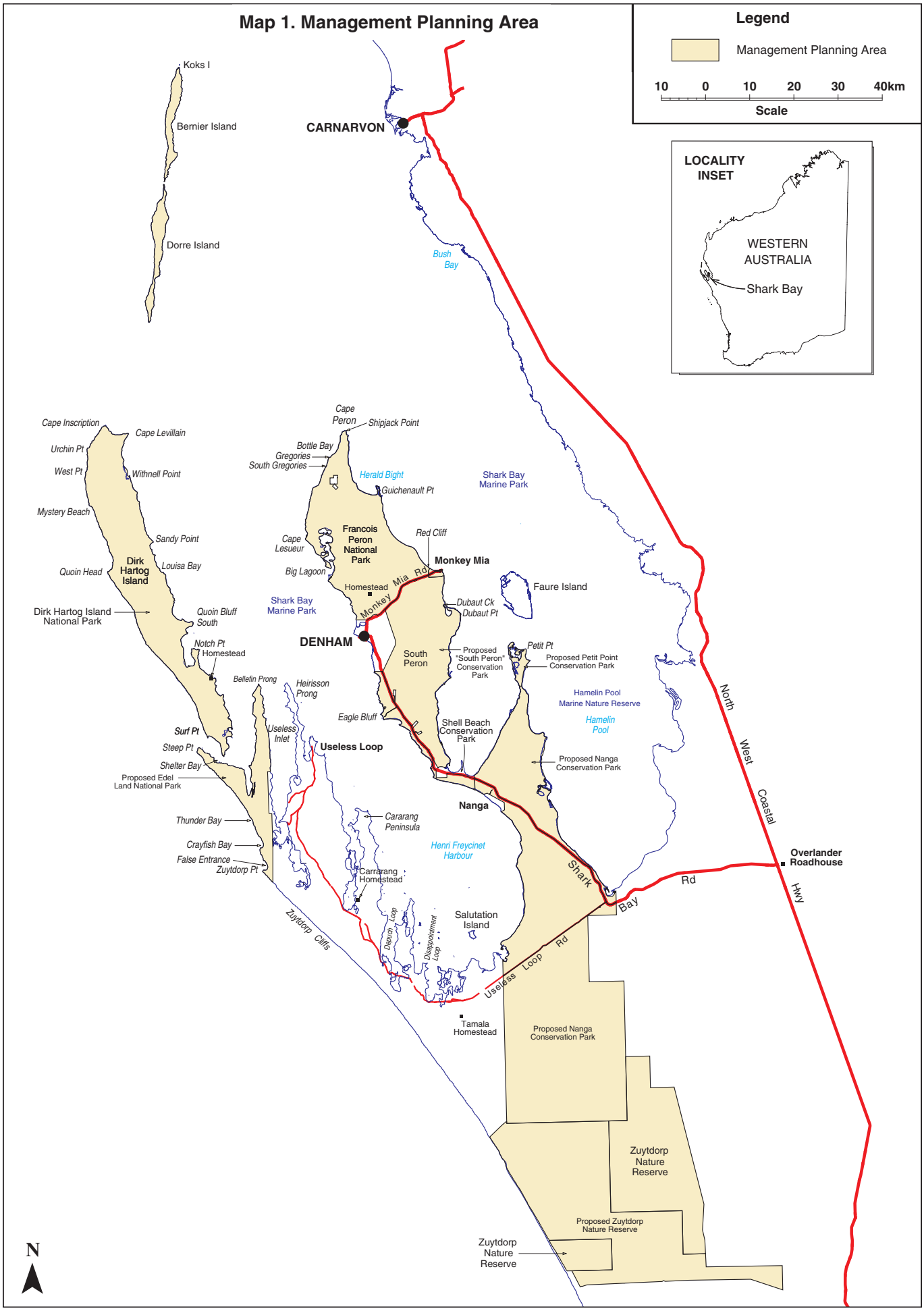
Woinarski J.C.Z 1990. Effects of fire on the bird communities of tropical woodlands and open forests in northern Australia. *Australian Journal of Ecology* 15: 1-22

PERSONAL COMMUNICATIONS

Kathy Himbeck – former Fauna Reintroduction Officer, Shark Bay District, Department of Environment and Conservation.

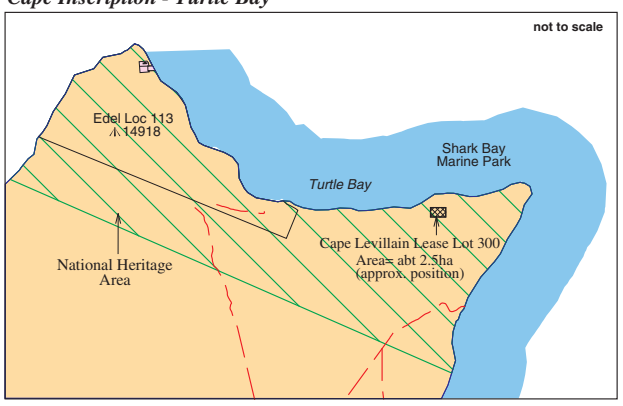
Cathy Zwick – Acting Senior Ranger, Shark Bay District, Department of Environment and Conservation.

Di Walker – Chair, World Heritage Property Scientific Advisory Committee.

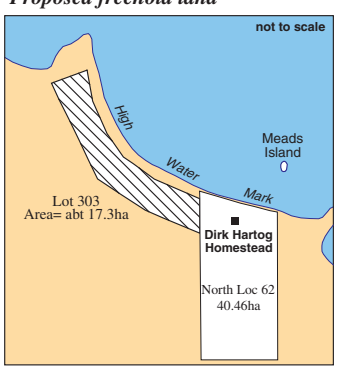

Map 1. Management Planning Area
Legend
Management Planning Area
10 0 10 20 30 40km
Scale
LOCALITY INSET
WESTERN AUSTRALIA
Shark Bay
Koks I
Bernier Island
Dorre Island
CARNARVON
Bush Bay
Cape Inscription
Cape Levillain
Urchin Pt
West Pt
Withnell Point
Mystery Beach
Sandy Point
Quoin Head
Dirk Hartog Island
Louisa Bay
Dirk Hartog Island National Park
Quoin Bluff South
Notch Pt Homestead
Cape Peron
Shipjack Point
Bottle Bay
Gregories
South Gregories
Herald Bight
Guichenault Pt
Shark Bay Marine Park
Cape Lesueur
Francois Peron National Park
Red Cliff
Monkey Mia
Big Lagoon
Homestead
Monkey Mia Rd
Faure Island
Shark Bay Marine Park
Dubaut Ck
Dubaut Pt
DENHAM
South Peron
Proposed "South Peron" Conservation Park
Petit Pt
Proposed Petit Point Conservation Park
Hamelin Pool Marine Nature Reserve
Hamelin Pool
Bellefin Prong
Heirisson Prong
Eagle Bluff
Shell Beach Conservation Park
Surf Pt
Steep Pt
Useless Inlet
Useless Loop
Shelter Bay
Proposed Edel Land National Park
Proposed Nanga Conservation Park
Nanga
Thunder Bay
Cararang Peninsula
Crayfish Bay
False Entrance
Zuytdorp Pt
Henri Freycinet Harbour
Carrarang Homestead
Salutation Island
Zuytdorp Cliffs
Depuch Loop
Disappointment Loop
Useless Loop Rd
Shark Bay Rd
North West Coastal Hwy
Overlander Roadhouse
Tamala Homestead
Proposed Nanga Conservation Park
Zuytdorp Nature Reserve
Proposed Zuytdorp Nature Reserve
Zuytdorp Nature Reserve
N

Map 2. Existing and Proposed Tenure

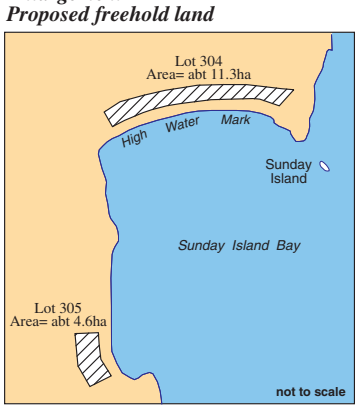
Enlargement 'C'
Cape Inscription - Turtle Bay



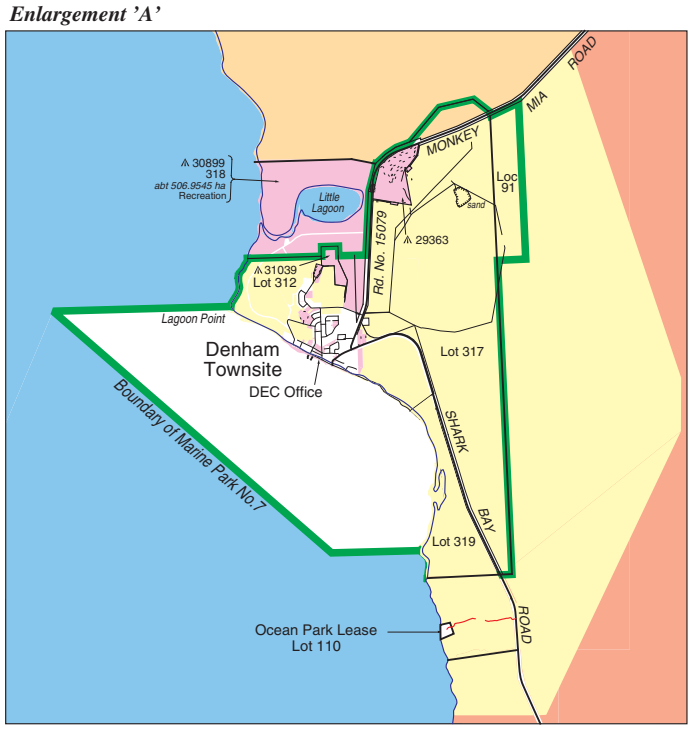
Enlargement 'D'
Proposed freehold land



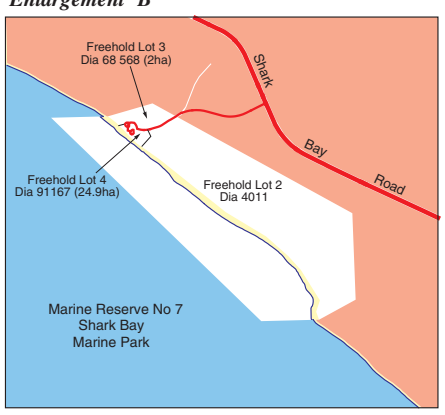
Enlargement 'E'
Proposed freehold land



Enlargement 'A'



Enlargement 'B'



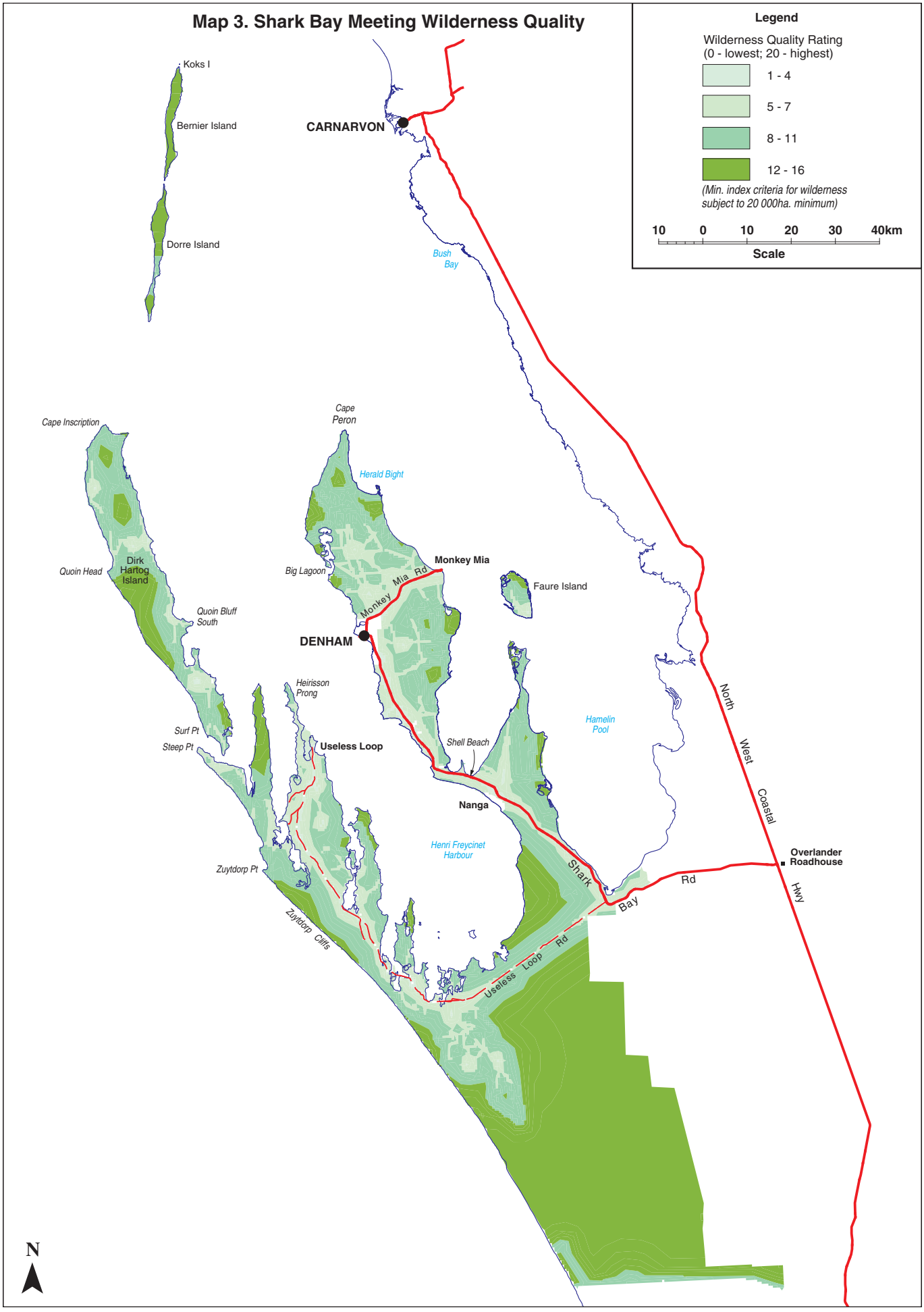
Legend

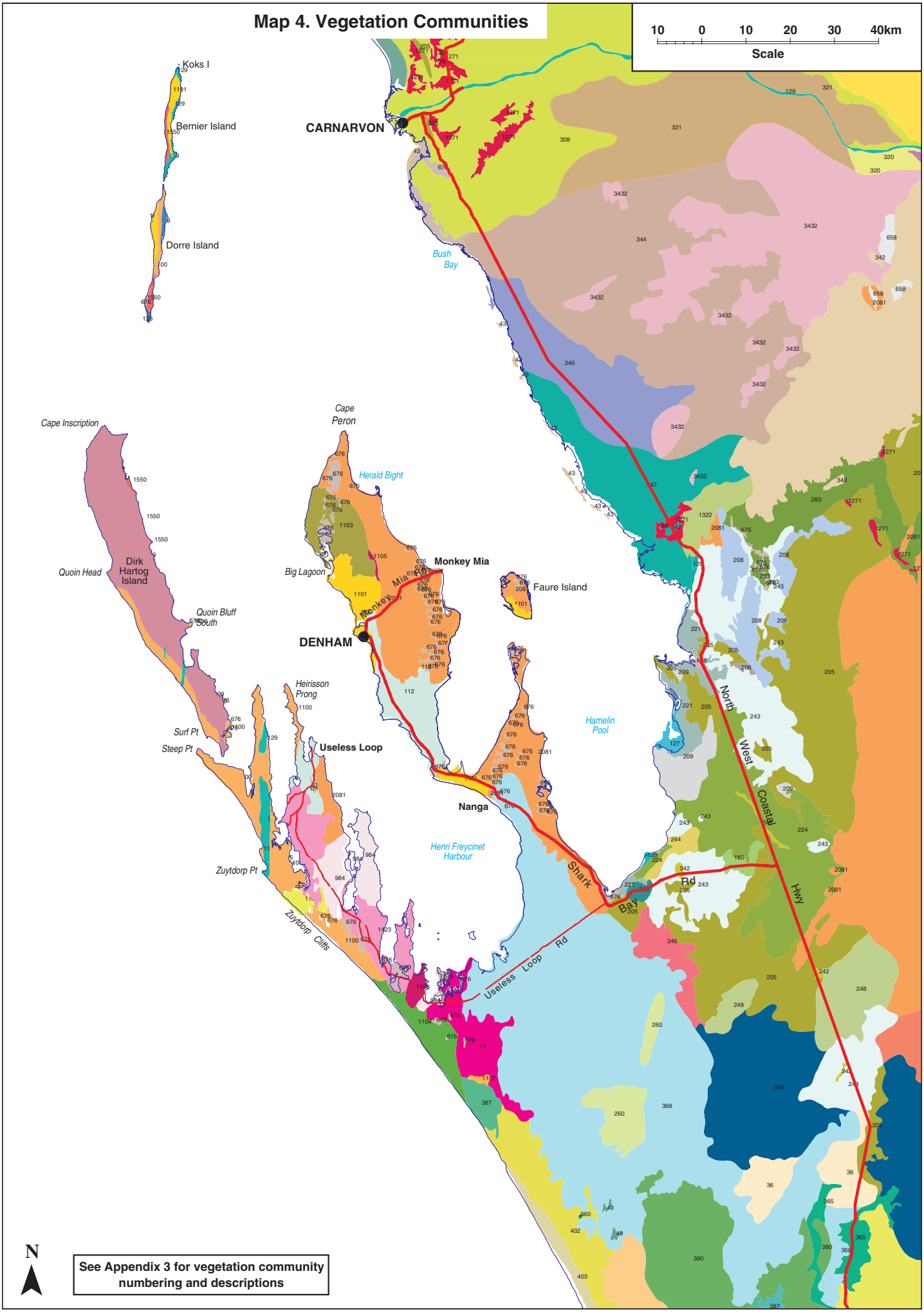
- World Heritage Property boundary
- Tenure as at 30 June 2008
- National park
- Nature reserve
- Conservation park
- UCL, proposed CALM Act reserve
- Section 5(1)(g) reserve
- Marine park
- Marine nature reserve
- Pastoral lease/townsite
- Unallocated Crown land
- Other Crown reserves
- Proposed tenure
- Proposed gravel reserve

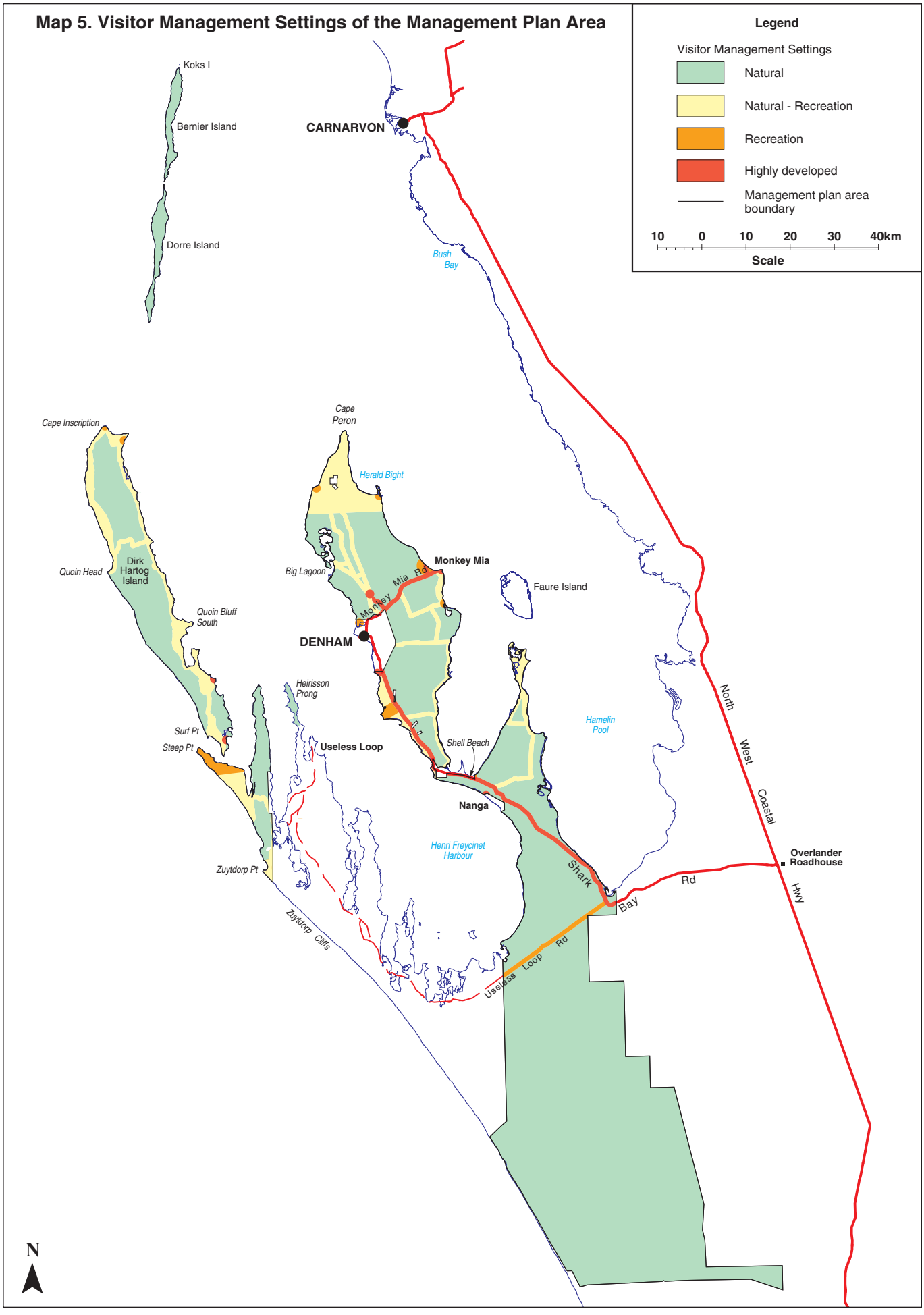
Scale
10 0 10 20 30 40km

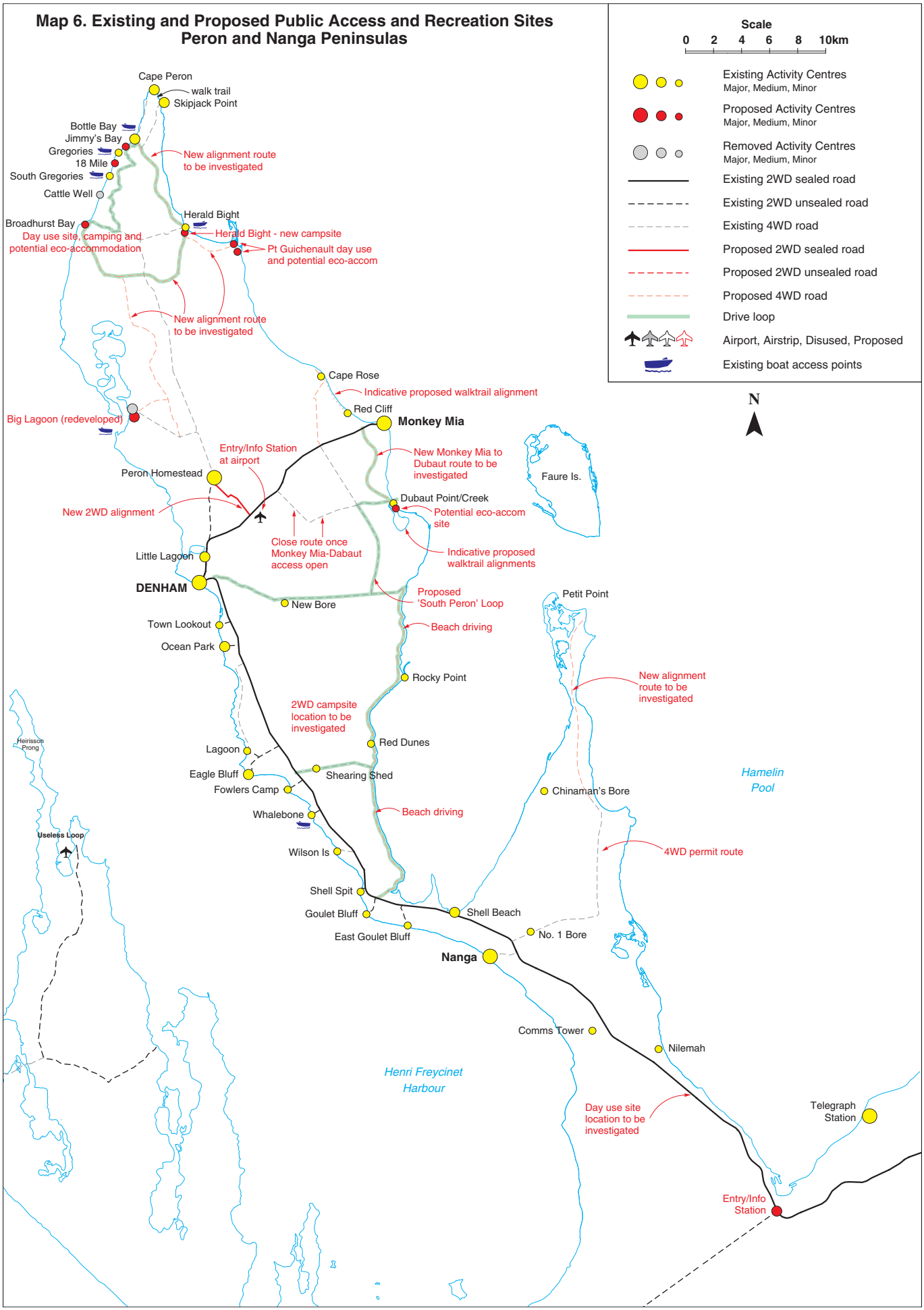
24°44' Latitude South
Koks I
CR 37383
113°20' Longitude East
3 nautical miles from High Water Mark
Bernier Island
Bernier & Dorre Islands
Nature Reserve
24869
Dorre Island
CR 37338
CARNARVON
610
Loc 343
World Heritage Boundary is 40 metres above High Water Mark
Bush
Bay
Cape Inscription
See Enlargement "C"
National Heritage Area
3114
470
Loc 76
Dirk Hartog Stn
Cape
Peron
CR 37742
Herald Bight
Marine Reserve No 7
Shark Bay
Marine Park
Francois
Peron
National
Park
42471
Red Cliff
Monkey Mia
16533
Big Lagoon
Quoin Head
Dirk
Hartog
Island
Dirk Hartog Island
National Park
Marine Reserve No 7
Shark Bay
Marine Park
3114
922
Faure
Stn
Faure Island
30885
3114
924
Loc 229
Yaringa Stn
Quoin Bluff South
30899
DENHAM
See Enlargement 'A'
Ocean Park
South
Peron
Loc 72
Proposed
"South Peron"
Conservation
Park
Proposed Petit Point
Conservation Park
11076
254
Ex Yaringa
Homestead
See Enlargement "D"
Lot 351
Edel
Loc 81
44988
Marine Reserve No.6
Hamelin Pool
Marine Nature Reserve
3114
453
Loc 227
Carbla Stn
See Enlargement "E"
Surf Pt
Steep Pt
CR 26400
Useless Loop
Shell Beach
Conservation
Park
42443
M 09/68
G 09/3
Comms tower
42398
24512
41076
Proposed Nanga
Conservation Park
Proposed Edel
Land National Park
3114
590
Loc 78
Carrarang
Stn
See
Enlargement 'B'
Nanga
Hamelin Pool
Caravan Park
658
Overlander
Roadhouse
Zuytdorp Pt
Comms tower
43381
Henri Freycinet
Harbour
Zuytdorp Cliffs
3 nautical miles from High Water Mark
3114
476
Loc 220
Hamelin Stn
Nanga
Loc 73
Loc 74
3114
835
Loc 71
Tamala Stn
Proposed Nanga
Conservation Park
Loc 77
3114
441
Loc 223
Coburn Stn
Womerangee Hill
ex Tamala Stn
Zuytdorp
Nature
Reserve
34771
Loc 52
3114
1100
Loc 213
Nerren Nerren Stn
Proposed Zuytdorp
Nature Reserve
Loc 3031
CR 29282
Loc 84
(museum site)
ex Murchison
House Stn
Loc 3033
N

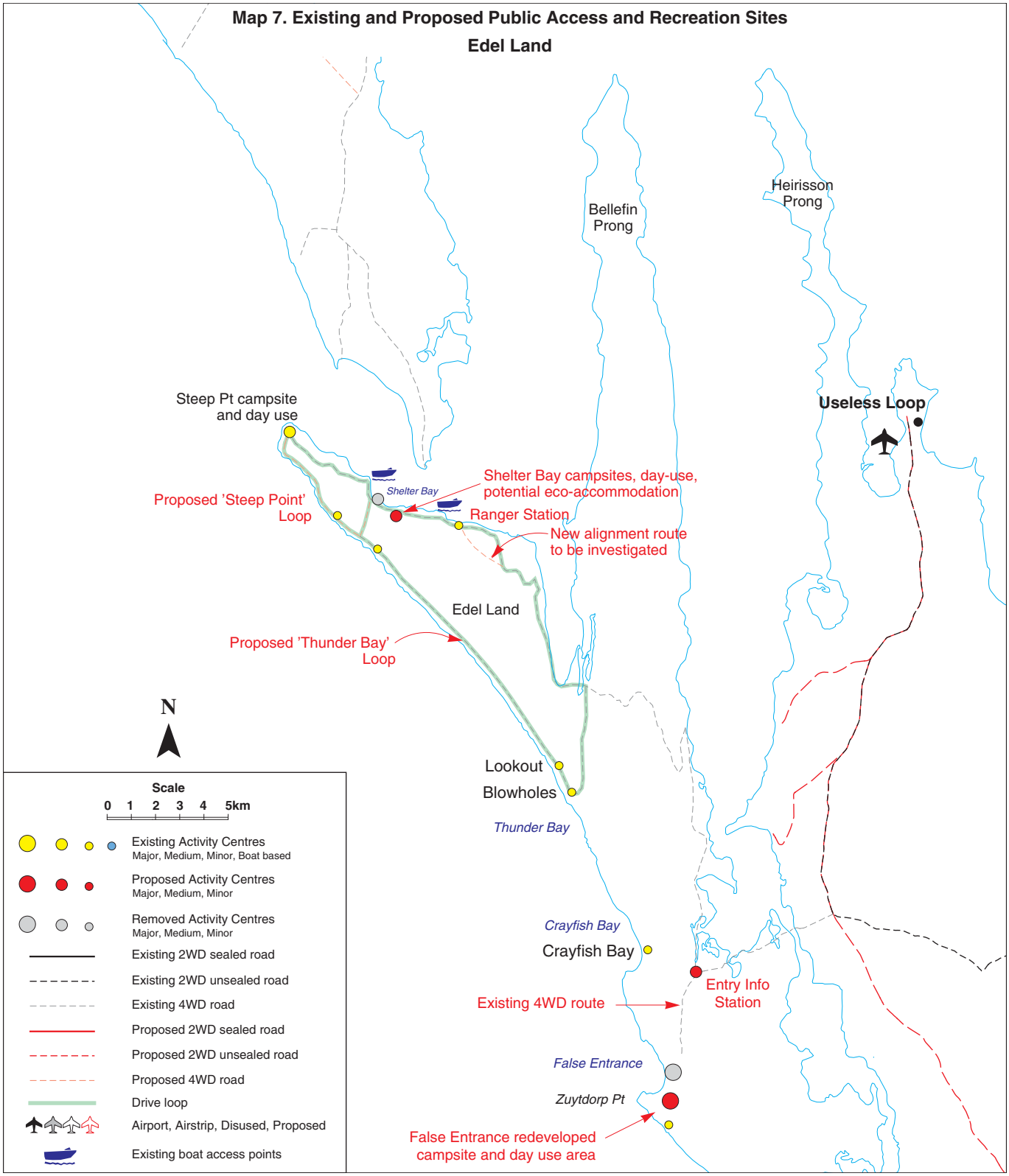
Map 3. Shark Bay Meeting Wilderness Quality



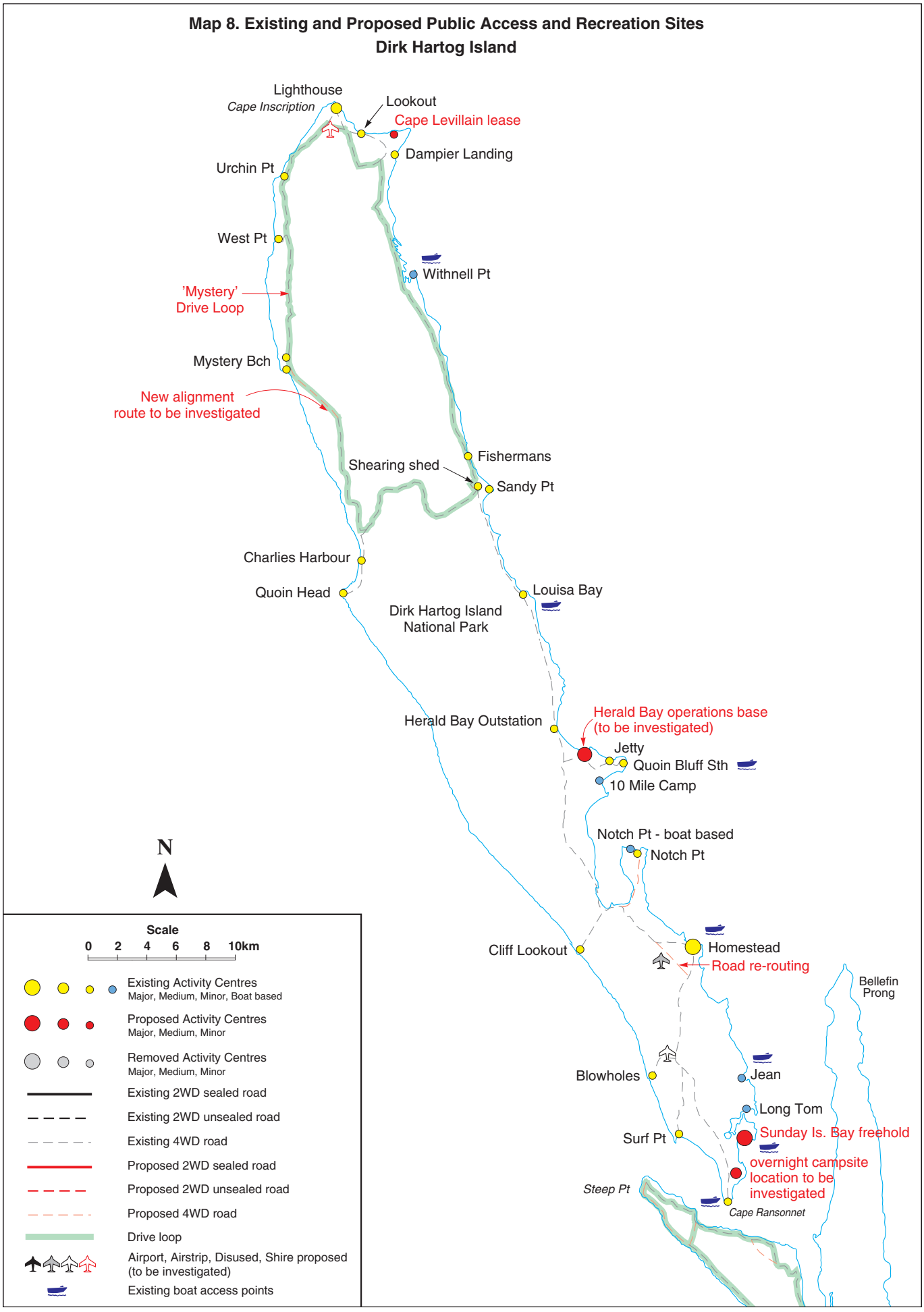

Map 4. Vegetation Communities
10 0 10 20 30 40km
Scale
Koks I
Bernier Island
Dorre Island
CARNARVON
Bush Bay
Cape Inscription
Cape Peron
Herald Bight
Dirk Hartog Island
Quoin Head
Quoin Bluff South
Big Lagoon
Monkey Mia
Monkey Mia Rd
Faure Island
DENHAM
Heirisson Prong
Surf Pt
Steep Pt
Useless Loop
Hamelin Pool
Nanga
Henri Freycinet Harbour
Zuytdorp Pt
Zuytdorp Cliffs
Shark Bay Rd
Useless Loop Rd
North West Coastal Hwy
N
See Appendix 3 for vegetation community numbering and descriptions


Map 5. Visitor Management Settings of the Management Plan Area
Legend
Visitor Management Settings
Natural
Natural - Recreation
Recreation
Highly developed
Management plan area boundary
10 0 10 20 30 40km
Scale
Koks I
Bernier Island
Dorre Island
CARNARVON
Bush Bay
Cape Inscription
Cape Peron
Herald Bight
Quoin Head
Dirk Hartog Island
Quoin Bluff South
Big Lagoon
Monkey Mia
Monkey Mia Rd
Faure Island
DENHAM
Heirisson Prong
Surf Pt
Steep Pt
Useless Loop
Shell Beach
Hamelin Pool
Nanga
Henri Freycinet Harbour
Zuytdorp Pt
Zuytdorp Cliffs
Shark Bay
Useless Loop Rd
North West Coastal Hwy
Overlander Roadhouse
Rd
N


Map 6. Existing and Proposed Public Access and Recreation Sites
Peron and Nanga Peninsulas
Scale
0 2 4 6 8 10km
Existing Activity Centres
Major, Medium, Minor
Proposed Activity Centres
Major, Medium, Minor
Removed Activity Centres
Major, Medium, Minor
Existing 2WD sealed road
Existing 2WD unsealed road
Existing 4WD road
Proposed 2WD sealed road
Proposed 2WD unsealed road
Proposed 4WD road
Drive loop
Airport, Airstrip, Disused, Proposed
Existing boat access points
N
Cape Peron
walk trail
Skipjack Point
Bottle Bay
Jimmy's Bay
Gregories
18 Mile
South Gregories
Cattle Well
New alignment route to be investigated
Broadhurst Bay
Day use site, camping and potential eco-accommodation
Herald Bight
Herald Bight - new campsite
Pt Guichenault day use and potential eco-accom
New alignment route to be investigated
Cape Rose
Indicative proposed walktrail alignment
Red Cliff
Monkey Mia
Big Lagoon (redeveloped)
Entry/Info Station at airport
New Monkey Mia to Dubaut route to be investigated
Faure Is.
Peron Homestead
Dubaut Point/Creek
Potential eco-accom site
New 2WD alignment
Close route once Monkey Mia-Dabaut access open
Indicative proposed walktrail alignments
Little Lagoon
DENHAM
New Bore
Proposed 'South Peron' Loop
Petit Point
Town Lookout
Beach driving
Ocean Park
Rocky Point
New alignment route to be investigated
2WD campsite location to be investigated
Red Dunes
Heirisson Prong
Lagoon
Eagle Bluff
Shearing Shed
Hamelin Pool
Fowlers Camp
Chinaman's Bore
Whalebone
Beach driving
Useless Loop
4WD permit route
Wilson Is
Shell Spit
Goulet Bluff
Shell Beach
East Goulet Bluff
No. 1 Bore
Nanga
Comms Tower
Nilemah
Henri Freycinet Harbour
Day use site location to be investigated
Telegraph Station
Entry/Info Station


Map 7. Existing and Proposed Public Access and Recreation Sites
Edel Land
Bellefin Prong
Heirisson Prong
Steep Pt campsite and day use
Useless Loop
Shelter Bay
Shelter Bay campsites, day-use, potential eco-accommodation
Proposed 'Steep Point' Loop
Ranger Station
New alignment route to be investigated
Edel Land
Proposed 'Thunder Bay' Loop
N
Lookout
Blowholes
Thunder Bay
Crayfish Bay
Crayfish Bay
Entry Info Station
Existing 4WD route
False Entrance
Zuytdorp Pt
False Entrance redeveloped campsite and day use area
Scale
0 1 2 3 4 5km
Existing Activity Centres
Major, Medium, Minor, Boat based
Proposed Activity Centres
Major, Medium, Minor
Removed Activity Centres
Major, Medium, Minor
Existing 2WD sealed road
Existing 2WD unsealed road
Existing 4WD road
Proposed 2WD sealed road
Proposed 2WD unsealed road
Proposed 4WD road
Drive loop
Airport, Airstrip, Disused, Proposed
Existing boat access points

Map 8. Existing and Proposed Public Access and Recreation Sites
Dirk Hartog Island



APPENDICES

APPENDIX 1: Performance Assessment

Key Performance Indicators for the Planning Area

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
PART B: MANAGEMENT DIRECTIONS AND PURPOSE				
Section 11: Existing and Proposed Tenure				
The establishment of a comprehensive, adequate and representative conservation reserve network.	To protect conservation reserves of the planning area by providing maximum security of tenure and purpose.	11.1 Tenure actions for which the Department and Conservation Commission are responsible.	11.1 Complete all tenure actions for which the Department and Conservation Commission are responsible within the life of the plan.	After five years
		11.2 Names of proposed reserves changed.	11.2 To formally name the proposed reserves as outlined in Table 3 within 5 years.	After five years
PART C: MANAGING THE NATURAL ENVIRONMENT				
Section 15: Biogeography				
The establishment of a comprehensive, adequate and representative conservation reserve network.	To achieve a comprehensive, adequate and representative conservation reserve system to protect biodiversity within the Shark Bay area.	15.1 The percentage of land managed for conservation purposes.	15.1 Minimum 15% of each sub-bioregion.	Annually
Section 16: Wilderness				
Remote and natural qualities of parts of the planning area.	To identify and provide statutory protection to wilderness areas and maintain and enhance wilderness qualities.	16.1 The amount of knowledge gathered (through research projects) relating to the Zuytdorp area.	16.1 The amount of knowledge gathered (through research projects) relating to the Zuytdorp area increases over the life of the plan.	Every five years
Section 17: Climate and Climate Change				
High number of threatened and priority native fauna. Importance of islands and	To understand the effects of climate change on the native biota and natural systems in the Shark Bay area and apply adaptive management principles	17.1 The size of populations of threatened fauna on islands within the planning area, subject to natural variations.	17.1 The size of populations of threatened fauna on islands within the planning area increases, subject to natural variation.	Every five years.

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
peninsulas for native and endemic fauna.	as required to ameliorate the impact of these changes.	17.2 The size of populations of priority and other specially protected plant species on islands within the planning area, subject to natural variation.	17.2 The size of populations of priority and other specially protected plant species on islands within the planning area increases, subject to natural variation.	Every five years
Section 18: Geology, Geomorphology and Soils				
	To protect and conserve the geology, geomorphology and soils of the planning area.	18.1 The condition of birridas within the planning area.	18.1 The condition of birridas within the planning area does not decrease over the life of the plan.	Every five years
Section 19: Hydrology and Catchment Protection				
	To protect the health and condition of water resources within the planning area.	19.1 The quality, quantity and pressure of water from uncapped bores within the planning area.	19.1 No further reduction in quality, quantity and pressure of water from uncapped bores within the planning area.	Every five years.
Section 20: Native Plants and Vegetation Associations				
Transition zone between two botanical provinces – South-west and Eremaean – with many species occurring at the southern or northern limit of their range. Presence of a diverse range of vegetation communities, rare and priority flora and many native plant species at the limits of their range.	To identify, protect and conserve the diversity and distribution of specially protected and other native plants and vegetation communities within the planning area.	20.1 Population size[14] and/or number of populations of critically endangered flora species located.	20.1 Increase in population size and/or number of populations of critically endangered flora species located.	Every five years.
		20.2 Species composition structure and vegetation density within vegetation associations.	20.2 Maintain or improve the species composition structure and vegetation density of vegetation associations.	Every five years.
Section 21: Native Animals				
High number of threatened and priority native fauna.	To identify, protect and conserve the specially protected and other native fauna and their habitats within the	21.1 The conservation status of the threatened species in the planning area.	21.1 No decline in conservation status.	Every five years.

[14] Population size is defined as the number of mature/reproducing plants.

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
Importance of islands and peninsulas for native and endemic fauna. Importance of Project Eden and proposed ecological restoration of Dirk Hartog Island project in wildlife conservation and particularly native fauna reconstruction.	planning area.	21.2 Range, number and size of populations of threatened fauna species, listed under the Wildlife Conservation Act in the planning area.	21.2 The range, number and size of populations of threatened fauna species in the planning area increases over the life of the plan.	Every five years.
ection 22: Ecological Communities				
Presence of ecosystems at risk.	To identify, protect and conserve ecological communities of special significance within the planning area.	22.1 The condition of threatened ecological communities and ecological communities at risk.	22.1 There will be no decline in the condition of known threatened ecological communities and ecological communities at risk.	Every five years.
Section 23: Environmental Weeds				
Presence of a diverse range of vegetation communities, rare and priority flora and many native plant species at the limits of their range.	To protect the values of the planning area whilst minimising the impact of environmental weeds.	23.1 The number and cover of weeds species at priority sites and with a high rating according to the Environmental Weed Strategy.	23.1 The number and area covered by weeds species with a high rating according the Environmental Weed Strategy declines.	Every five years.
Section 24: Introduced and Other Problem Animals				
Extensive areas of intact fauna habitat and presence of threatened, priority and endemic native fauna. Long term introduced animal control programs have resulted in increase in native fauna populations including reintroduced species.	To minimise the numbers of introduced animals and, where possible negate the impacts of problem animals on the key values of the planning area.	24.1 Number or number of populations of feral goats/foxes/cats.	24.1 A decrease in the number or number of populations of feral goats or foxes.	Every five years.
		24.2 Number of feral goats on Dirk Hartog Island and Peron Peninsula.	24.2 Complete eradication of goats on Dirk Hartog Island and Peron Peninsula within the life of the plan.	Every five years
		24.3 Number of feral cats on Dirk Hartog Island.	24.3 Complete eradication of cats from Dirk Hartog Island within the life of the plan.	Every five years
		24.4 Number of introduced animals on Bernier & Dorre Islands.	24.4 Absence of introduced animals on Bernier & Dorre Islands.	Every five years
Section 25: Diseases				
Presence of a diverse range of	To prevent the introduction and	25.1 Response to signs of unusual	25.1 A rapid response to signs of	Annually

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
vegetation communities, rare and priority flora and many native plant species at the limits of their range. Extensive areas of intact fauna habitat and presence of threatened, priority and endemic native fauna.	minimise the spread of plant and animal diseases in the planning area.	changes in clinical disease, lowered reproduction, increased mortality and/or population decline of threatened fauna with intensive disease/pathogen screening and appropriate quarantine and protection measures.	unusual changes in clinical disease, lowered reproduction, increased mortality and/or population decline of threatened fauna with intensive disease/pathogen screening and appropriate quarantine and protection measures.	
Section 26: Fire				
Presence of a diverse range of vegetation communities, rare and priority flora and many native plant species at the limits of their range. Extensive areas of intact fauna habitat and presence of threatened, priority and endemic native fauna.	❖ To protect life and community assets in and near the planning area; and ❖ To increase knowledge and understanding of vital attributes of flora and fauna, fire history and fire ecology, as a basis for advancing ecologically appropriate fire management.	26.1 The impact of bushfire on life and community assets	26.1 No loss of life, significant community assets, or serious injury attributable to the Department's fire management	Annually
		26.2 The impact of fire regimes on threatened flora and fauna populations.	26.2 No loss or declines of threatened flora and fauna populations as a result of fire regimes applied, over the life of the plan.	Every five years
		26.3 Advances in fire ecology knowledge.	26.3 Fire ecology research plan prepared and implemented. Targeted adaptive management programs developed and implemented.	Every five years
PART D: MANAGING OUR CULTURAL HERITAGE				
Section 28: Indigenous Heritage				
Extensive evidence of Indigenous occupation and use. Indigenous sites of cultural and archaeological significance.	To identify, protect, conserve and, where appropriate, present the Indigenous cultural heritage and cultural resources of the planning area in consultation with Indigenous people.	28.1 The protection of Indigenous cultural heritage.	28.1 No disturbance of a registered or unregistered place without consultation or formal clearances according to section 18 of the Aboriginal Heritage Act.	Every five years
Section 29: Non-Indigenous Heritage				
Extensive evidence of non-Indigenous exploration, occupation and use. Significant cultural heritage to the	To identify, protect, conserve and present the non-Indigenous cultural heritage of the planning area.	29.1 The protection of non-Indigenous cultural heritage.	29.1 Development of a non-Indigenous cultural heritage inventory across the planning area.	After five years

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
exploration of Australia.				
PART E: MANAGING VISITOR USE				
Section 30: Recreation Use Planning				
A terrestrial environment that provides for a wide range of nature-based recreation and tourism opportunities and experiences. A sense of remoteness set in a mostly natural environment.	To provide visitors with a range of nature-based experiences within the planning area whilst ensuring the environmental impacts are managed within acceptable limits.	30.1 The range of visitor management settings over the life of the plan.	30.1 No recreation development or use inconsistent with the visitor management setting without approval of the Conservation Commission.	After five years.
Section 31: Recreation and Tourism Opportunities				
Visitors continue to value the unspoilt surroundings, coastal scenery, fishing, wildlife (both marine and terrestrial) and sense of remoteness of the natural environment.	To provide visitors with a range of nature-based recreation and tourism opportunities within the planning area that facilitates their enjoyment, understanding and appreciation of the key values.	31.1 Visitor satisfaction levels of nature-based experiences.	31.1 Visitor satisfaction levels of nature-based experiences are maintained or increased from 2012 levels.	Annually.
Section 33.3: Overnight Stays				
Visitors continue to value the unspoilt surroundings, coastal scenery, fishing, wildlife (both marine and terrestrial) and sense of remoteness of the natural environment.	To provide opportunities for visitors to stay overnight within the planning area in appropriately designed built accommodation and campsites, and that facilitate visitor enjoyment, appreciation and understanding of the key values whilst minimising environmental impacts.	33.1 The use of undesignated camping areas.	33.1 The use of undesignated camping areas decreases over the life of the plan.	Annually
Section 35: Visitor Safety				
A terrestrial environment that provides the public with nature-based opportunities in safely managed environment.	To minimise risks to the public who visit the planning area whilst maintaining a range of visitor experiences.	35.1 Percentage of accidents/incidents and visitor injuries per visit reported to the Department.	35.1 Reduction in the percentage of accidents/incidents and visitor injuries per visit reported to the Department.	Annually
Section 37: Visual Landscape				
Outstanding landscapes and seascapes of world heritage value.	To protect and enhance the planning area's visual landscape qualities.	32.1 Changes to areas of high scenic quality.	32.1 No significant loss of areas of high scenic quality over the life of the plan.	Every five years

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
Section 38.1: Bernier, Dorre and Koks Islands - Access				
Visitors continue to value the unspoilt surroundings, coastal scenery, fishing, wildlife (both marine and terrestrial) and sense of remoteness of the natural environment.	The objective is to limit access to Bernier, Dorre and Koks Islands so there are no adverse impacts on the key values of the planning area or visitor appreciation of these values and minimal conflict with other users.	38.1 Level of unauthorised camping on Bernier and Dorre Islands over the life of the plan.	38.1 A reduction in the level of unauthorised camping over the life of the plan.	Annually
Section 43.1: Edel Land – Recreation and Tourism Opportunities				
Visitors continue to value the unspoilt surroundings, coastal scenery, fishing, wildlife (both marine and terrestrial) and sense of remoteness of the natural environment.	The objective is to provide visitors with a range of nature-based recreation and tourism opportunities within Edel Land that facilitate their enjoyment, understanding and appreciation of the key values.	43.1 Visitor satisfaction levels of nature-based experiences at a range of sites in Edel Land.	43.1 Visitor satisfaction levels of nature-based experiences at a range of sites in Edel Land are maintained or increased from 2009 levels.	Every five years
Section 43.4: Edel Land – Visitor Safety				
	The objective is to minimise risks to the public who visit Edel Land while maintaining a range of visitor experiences.	43.2 Percentage of accidents/incidents and visitor injuries per visit to Edel Land reported to the Department.	43.2 Reduction in the percentage of accidents/incidents and visitor injuries per visit to Edel Land reported to the Department.	Annually
Section 44.4: Dirk Hartog Island – Visitor Safety				
	The objective is to minimise risks to the public who visit Dirk Hartog Island National Park while maintaining a range of visitor experiences.	44.4 Percentage of accidents/incidents and visitor injuries per visit to Dirk Hartog Island National Park reported to the Department.	44.4 Reduction in the percentage of accidents/incidents and visitor injuries per visit to Dirk Hartog Island National Park reported to the Department.	Annually
PART F: MANAGING RESOURCE USE				
Section 48: Rehabilitation				
Extensive areas of intact fauna habitat and diverse vegetation communities with many threatened native flora and fauna necessary to sustain ecological processes.	To restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function.	48.1 Changes in the area of rehabilitated land and the number of unnecessary tracks rehabilitated.	48.1 Increase in the area of disturbed land rehabilitated, including rehabilitation of unnecessary tracks.	Every five years
PART G: INVOLVING THE COMMUNITY				
Section 55: Information, Interpretation and Education				
World significant heritage natural	To promote community awareness,	55.1 Level of visitor satisfaction	55.1 Remains stable or increases	Every five years.

KEY VALUES	OBJECTIVE	KEY PERFORAMNCE INDICATORS		
		Performance Measure	Target	Reporting Requirements*
values and nationally significant cultural values for the public to experience, understand and appreciate.	understanding and appreciation of the World Heritage and other key values of the planning area and engender support of management activities.	with education and interpretation opportunities available in the planning area.	over the life of the plan.	
		55.2 Number of hits to the Shark Bay World Heritage Property website	55.2 Number of hits increases over the life of the plan.	Annually
Section 56: Working with the Community				
Opportunities for the public to be involved and value the natural and cultural values.	To facilitate effective community involvement in management of the planning area.	56.1 The number of registered volunteers and the level of volunteer hours.	56.1 An increase in the number of registered volunteers and the level of volunteer hours.	After three years.

* Investigate the cause and report to the Conservation Commission for action

APPENDIX 2: Rare and Priority Flora in the Planning Area

Family	Species	Rank	Threatening Processes (R, P1 & P2 only)
Orchidaceae	*Caladenia barbarella*	R	Feral animals (goats); changed fire regimes; exotic weeds.
Myrtaceae	*Eucalyptus beardiana*	R	Grazing pressure; changed fire regimes.
Myrtaceae	*Chamelaucium oenanthum*	P1	Feral animals (goats); grazing pressure.
Lamiaceae	*Dicrastylis sp.* Denham	P1	Feral animals (goats); grazing pressure.
Myoporaceae	*Eremophila cuneata*	P1	Mining; feral animals (goats).
Myoporaceae	*Eremophila splendens*	P1	Grazing pressure.
Myrtaceae	*Pileanthus aurantiacus*	P1	Feral animals (goats); grazing pressure.
Chenopodiaceae	*Sclerolaena stylosa*	P1	Feral animals (goats); grazing pressure.
Myrtaceae	*Thyptomene sp.* Carrarang (M.E. Trudgen 7420)	P1	Increasing fragmentation, loss of remnants and lack of recruitment; grazing pressure; changed fire regimes.
Myrtaceae	*Thyptomene sp.* Steep Point (M.E. Trudgen 7421)	P1	Increasing fragmentation, loss of remnants and lack of recruitment; grazing pressure; changed fire regimes.
Myrtaceae	*Thyptomene sp.* Tamala (M.E. Trudgen 7384)	P1	Increasing fragmentation, loss of remnants and lack of recruitment; grazing pressure; changed fire regimes.
Myrtaceae	*Verticordia lepidophylla var quantula*	P1	Feral animals (goats); grazing pressure.
Malvaceae	*Abutilon sp.* Hamelin (A. M. Ashby 2196)	P2	Feral animals (goats); grazing pressure; exotic weeds.
Malvaceae	*Abutilon sp.* Quobba (H.Demarz 3858)	P2	Feral animals (goats); grazing pressure; exotic weeds.
Mimosaceae	*Acacia subrigida*	P2	Feral animals (goats); grazing pressure; exotic weeds.
Dasypogonaceae	*Acanthocarpus rupestris*	P2	Feral animals (goats); grazing pressure.
Asteraceae	*Angianthus microcephalus*	P2	Feral animals (goats); grazing pressure.
Solanaceae	*Anthotroche myoporoides*	P2	Feral animals (goats); grazing pressure.
Myrtaceae	*Calytrix harvestiana*	P2	Feral animals (goats); grazing pressure; changed fire regimes.
Asteraceae	*Chthonocephalus muellerianus*	P2	Feral animals (goats); grazing pressure; exotic weeds.
Asteraceae	*Chthonocephalus tomentellus*	P2	Feral animals (goats); grazing pressure; exotic weeds.
Rhamnaceae	*Cryptandra scoparia var. microcephala*	P2	Feral animals (goats); broad scale clearing; increasing fragmentation, loss of remnants and lack of recruitment.
Myoporaceae	*Eremophila glabra subsp. psammophora*	P2	Feral animals (goats); grazing pressure; exotic weeds.
Myoporaceae	*Eremophila occidens*	P2	Changed fire regimes; feral animals (goats).
Proteaceae	*Grevillea stenomera*	P2	Feral animals (goats); grazing pressure.
Brassicaceae	*Lepidium biplicatum*	P2	Feral animals (goats); exotic weeds; changed fire regimes; changed hydrology.
Myrtaceae	*Melaleuca huegelii subsp. pristicensis*	P2	Grazing pressure; feral animals (goats); changed hydrology; exotic weeds.
Asteraceae	*Olearia occidentissima*	P2	Grazing pressure; feral animals (goats); exotic weeds.
Amaranthaceae	*Ptilotus alexandri*	P2	Feral animals (goats); grazing pressure; changed fire regimes; exotic weeds.

Family	Species	Rank	Threatening Processes (R, P1 & P2 only)
Goodeniaceae	*Scaevola chrysopogon*	P2	Grazing pressure; feral animals (goats); changed fire regimes.
Asteraceae	*Sondottia glabrata*	P2	Grazing pressure; increasing fragmentation, loss of remnants and lack of recruitment; feral animals (goats)
Myrtaceae	*Thryptomene sp.* Eagle Gorge (A.G. Gunness 2360)	P2	Feral animals (goats); recreation.
Mimosaceae	*Acacia drepanophylla*	P3	
Dasypogonaceae	*Acanthocarpus parviflorus*	P3	
Solanaceae	*Anthrocercis intricata*	P3	
Anthericaceae	*Arnocrinum drummondii*	P3	
Asteraceae	*Brachyscome haophila*	P3	
Asteraceae	*Calocephalus aervoides*	P3	
Restionaceae	*Desmocladus biformis*	P3	
Chloanthaceae	*Dicrastylis micrantha*	P3	
Proteaceae	*Grevillea annulifera*	P3	
Proteaceae	*Grevillea rogersoniana*	P3	
Lamiaceae	*Hemigenia saligna*	P3	
Restionaceae	*Lepidobolus densus*	P3	
Molluginaceae	*Macarthuria intricata*	P3	
Lamiaceae	*Physopsis chrysophylla*	P3	
Myrtaceae	*Pileanthus bellus*	P3	
Lamiaceae	*Pityrodia glutinosa*	P3	
Rhamnaceae	*Stenanthemum divaricatum*	P3	
Myrtaceae	*Verticordia cooloomia*	P3	
Myrtaceae	*Verticordia dichroma var. dichroma*	P3	
Myrtaceae	*Verticordia dichroma var. syntoma*	P3	
Papilionaceae	*Daviesia purpurascens*	P4	
Papilionaceae	*Jacksonia dendrospinosa*	P4	
Papilionaceae	*Jacksonia velutina*	P4	
Brassicaceae	*Lepidium puberulum*	P4	
Poaceae	*Triodia bromoides*	P4	
Myrtaceae	*Verticordia capillaris*	P4	

NOTES:

- Includes species only within the planning area and not adjacent areas. Further surveys are most likely to increase species numbers and variety.
- See Glossary for an explanation of Priority rankings.

APPENDIX 3: Vegetation Communities of the Shark Bay Area

(To be read in conjunction with Map 4)

Number	Vegetation Description
17	Shrublands; Acacia rostellifera thicket
36	Shrublands; thicket
49	Shrublands; mixed heath
112	Hummock grasslands
127	Bare areas; mud flats
127-1	Bare areas; claypans
128	Rock outcrops
129	Bare areas; drift sand
160	Shrublands; snakewood and Acacia victoriae scrub
205	Shrublands; Acacia sclerosperma and bowgada scrub
206	Shrublands; bowgada and grevillea scrub
208	Mosaic; shrublands; Acacia sclerosperma and bowgada scrub-shrublands; bowgada & grevillea scrub
208-1	Shrublands; bowgada and associated species scrub
209	Shrublands; Acacia sclerosperma and minnie ritchie scrub
221	Succulent steppe; saltbush
224	Shrublands; waterwood and Acacia victoriae scrub
242	Succulent steppe with scrub; snakewood over saltbush
243	Shrublands; bowgada and minnie ritchie scrub
244	Shrublands; Acacia sclerosperma and A. victoriae scrub
245	Mosaic; shrublands; bowgada and minnie ritchie scrub-succulent steppe; saltbush & bluebush
246	Hummock grasslands
248	Shrublands; bowgada scrub with scattered red mallee and Eucalyptus species
260	Mosaic; Shrublands tree-heath between sandhills; Banksia ashbyi
283	Shrublands; Acacia sclerosperma
342	Mosaic; low woodland; waterwood-shrublands; Acacia sclerosperma
347	Mosaic; shrublands; Acacia sclerosperma
364	Shrublands; bowgada scrub with scattered eucalypts and cypress pine
365	Shrublands; bowgada and jam scrub with scattered York gum and red mallee
368	Shrublands; tree-heath between sandhills, Banksia ashbyi
380	Shrublands; scrub-heath on sandplain
387	Shrublands; Melaleuca cardiophylla thicket
402	Shrublands; heath on coastal limestone
403	Shrublands; Acacia ligulata scrub-heath
676	Succulent steppes; samphire
984	Mosaic; shrublands; acacia and melaleuca scrub-succulent steppe; saltbush
1099	Hummock grasslands; shrub steppe; wattle scrub and heath of Acacia ligulata and A. rostellifera
1100	Hummock grassland; dwarf shrub steppe; mixed eucoid shrubs and spinifex
1101	Shrublands; Acacia ligulata and A. rostellifera thicket
1102	Mosaic; shrublands; mixed heath-shrublands; acacia patchy scrub
1103	Shrublands; Acacia and Lamarchea thicket
1105	Hummock grasslands
1106	Mosaic; shrublands; scrub-heath-shrublands; Acacia rostellifera and Melaleuca cardiophylla thickets
1107	Open low woodland; Eucalyptus oraria
1322	Shrublands; Acacia sclerosperma
1423	Shrublands; scrub-heath
1550	Shrublands; dwarf scrub (Dirk Hartog Island)

APPENDIX 4: Specially Protected and Priority Fauna within the Planning Area.

Species	Common Name	Ranking	Threatening Processes
Schedule 1 – Fauna that is rare or likely to become extinct			
Mammals			
Bettongia lesueur lesueur	Burrowing bettong (Shark Bay islands)	VU	Feral animals.
Lagorchestes hirsutus bernieri	Rufous hare-wallaby (subsp Bernier & Dorre Island)	VU	Feral animals.
Lagostrophus fasciatus fasciatus	Banded hare wallaby	VU	Feral animals.
Leporillus conditor	Greater stick nest rat	VU	Feral animals.
Macrotis lagotis	Bilby	VU	Feral animals.
Perameles bougainville bougainville	Western barred bandicoot	EN	Feral animals; pathogens.
Pseudomys fieldi	Shark Bay mouse	VU	Feral animals.
Birds			
Calamanthus campestris dorrie	Dorre Island rufous fieldwren	VU	Increasing fragmentation, loss of remnants and lack of recruitment.
Calamanthus campestris hartogi	Dirk Hartog Island rufous fieldwren	VU	Grazing pressure; feral animals (cats); increasing fragmentation, loss of remnants and lack of recruitment.
Leipoa ocellata	Malleefowl	VU	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment; grazing pressure.
Malurus lamberti bernieri	Shark Bay variegated fairy-wren	VU	Grazing pressure; feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.
Malurus leucopterus leucopterus	Dirk Hartog Island black and white fairy-wren	VU	Grazing pressure; feral animals (cats); increasing fragmentation, loss of remnants and lack of recruitment.
Stipiturus malachurus hartogi	Dirk Hartog Island southern emu-wren	VU	Grazing pressure; feral animals (cats); increasing fragmentation, loss of remnants and lack of recruitment.
Reptiles			
Caretta caretta	Loggerhead turtle	EN	Feral animals (foxes, cats); pollution.
Chelonia mydas	Green turtle	VU	Feral animals (foxes, cats); pollution.
Ctenotus zastictus	Hamelin ctenotus	VU	Grazing pressure.
Dermochelys cariacea	Leatherback turtle	VU	Feral animals (foxes, cats); pollution.
Egernia stokesii aethiops	Baudin Island spiny-tailed skink	VU	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.
Egernia stokesii badia	Western spiny-tailed skink	VU	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.

Species	Common Name	Ranking	Threatening Processes
Natator depressus	Flatback turtle	VU	Feral animals (foxes, cats); pollution
Schedule 4 – Fauna that is specially protected			
Reptile			
Aspidites ramsayi	Woma	S4	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.
Priority Fauna			
Mammals			
Hydromys chrysogaster	Water rat	P4	Feral animals.
Bettongia pennicillata	Woylie	P5	Feral animals.
Isodon obesulus fusciventer	Southern brown bandicoot	P5	Feral animals.
Birds			
Amytornis textilis textilis	Thick billed grasswren (western subsp)	P4	Feral animals (cats, foxes); increasing fragmentation, loss of remnants and lack of recruitment; developments.
Ardeotis australis	Australian bustard	P4	Grazing pressure; feral animals (cats, foxes); increasing fragmentation, loss of remnants and lack of recruitment.
Burhinus grallarius	Bush stone curlew	P4	Grazing pressure; feral animals (cats, foxes); increasing fragmentation, loss of remnants and lack of recruitment.
Numenius madagascariensis	Eastern curlew	P4	Grazing pressure; feral animals (cats, foxes); increasing fragmentation, loss of remnants and lack of recruitment.
Reptiles			
Aprasia haroldi	Shark Bay worm lizard	P1	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.
Pletholax gacilis edelensis	A pygopod	P3	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.
Lerista humphriesi		P3	Feral animals (foxes, cats); increasing fragmentation, loss of remnants and lack of recruitment.

NOTE:

- See page Glossary for an explanation of Priority rankings and threatened fauna.

APPENDIX 5: Weed Species within the Planning Area.

Scientific Name	Common Name	Environmental Weed Strategy Rating*	Declared under the ARRP Act
Acetosa vesicaria	Ruby dock	HIGH	
Aerva javanica	Kapok bush	HIGH	
Brassica tournefortii	Mediterranean turnip	HIGH	
Bromus diandrus	Great brome	HIGH	
Cenchrus ciliaris	Buffel grass	HIGH	
Cenchrus setigerus	Birdwood grass	HIGH	
Lupinus cosentinii	Sandplain lupin	HIGH	
Lycium ferocissimum	African box-thorn	HIGH	
Passiflora foetida	Stinking passion flower	HIGH	
Passiflora foetida var hispida		HIGH	
Aira caryophyllea	Silvery hairgrass	MOD	
Anagallis arvensis var. caerulea	Pimpernel	MOD	
Arctotheca calendula	Cape weed	MOD	
Avena barbata	Bearded oat	MOD	
Briza minor	Shivery grass	MOD	
Bromus rubens	Red brome	MOD	
Cakile maritima	Sea rocket	MOD	
Centaurea melitensis	Maltese cockspur	MOD	
Cuscuta epithymum	Lesser dodder	MOD	
Cynodon dactylon	Couch	MOD	
Dischisma arenarium		MOD	
Ehrharta brevifolia	Annual veldt grass	MOD	
Ehrharta brevifolia var. cuspidata		MOD	
Ehrharta longiflora	Annual veldt grass	MOD	
Eragrostis barrelieri	Pitted lovegrass	MOD	
Erodium aureum	Corkscrew	MOD	
Erodium cicutarium	Common storksbill	MOD	
Hordeum leporinum	Barley grass	MOD	
Hypochaeris glabra	Smooth catsear	MOD	
Juncus bufonius	Toad rush	MOD	
Lamarckia aurea	Goldentop	MOD	
Mesembryanthemum crystallinum	Iceplant	MOD	
Orobanche sp.	Broomerape	MOD	Yes
Pentaschistis airoides	False hairgrass	MOD	
Polypogon monspeliensis	Annual beardgrass	MOD	
Pseudognaphalium luteoalbum	Jersey cudweed	MOD	
Rostraria cristata	Annual cat's tail	MOD	
Rostraria pumila	Rough cat's tail	MOD	
Schismus barbatus	Kelch grass	MOD	
Sisymbrium orientale	Indian hedge mustard	MOD	
Solanum nigrum	Black berry nightshade	MOD	
Sonchus oleraceus	Common cowthistle	MOD	
Sonchus tenerrimus	Clammy sowthistle	MOD	
Spergularia rubra	Red sand spurry	MOD	
Tamarix aphylla[1]	Athel pine	MOD	Yes
Urospermum picroides	False hawkbit	MOD	
Argemone ochroleuca	Mexican poppy	MILD	
Asphodelus fistulosus	Onion weed	MILD	
Medicago polymorpha	Burr medic	MILD	
Medicago truncatula	Barrel medic	MILD	

Scientific Name	Common Name	Environmental Weed Strategy Rating*	Declared under the ARRP Act
Nicotiana glauca[1]	Tree tobacco	MILD	
Oxalis pes-caprae	Soursob	MILD	
Pennisetum setaceum	Fountain grass	MILD	
Poa annua	Winter grass	MILD	
Raphanus raphanistrum	Wild radish	MILD	
Silene nocturna	Mediterranean catchfly	MILD	
Spergularia diandra	Lesser sand spurry	MILD	
Brassica juncea	Indian mustard	LOW	
Bromus japonicus var. japonicus	Japanese brome	LOW	
Carthamus lanatus[1]	Saffron thistle	LOW	Yes
Cerastium glomeratum	Sticky mouse-eared chickweed	LOW	
Chenopodium murale	Nettle-leaf goosefoot	LOW	
Citrullus lanatus	Afgham melon or pie melon	LOW	
Emex australis	Doublegee	LOW	Yes
Malva parviflora	Marshmallow	LOW	
Polycarpon tetraphyllum	Fourleaf allseed	LOW	
Ricinus communis	Castor oil plant	LOW	
Setaria verticillata	Whorled pigeon grass	LOW	
Silene gallica var. gallica		LOW	
Sisymbrium erysimoides	Smooth mustard	LOW	
*Agave Americana**	Century Plant/Agave	TBA	
*Bidens bipinnata**	Bipinnate beggartick	TBA	
*Cuscuta planiflora**	Small seeded dodder	TBA	
Echium plantagineum	Paterson's curse	NR	Yes
Hornungia procumbens	Oval purse	NR	
Isolepis marginata	Coarse club-rush	NR	
*Melilotus indicus**		TBA	
Oxalis corniculata	Yellow wood sorrel	NR	
Tribulus terrestris	Caltrop	NR	

NOTES:
*TBA – To be advised
NR – Not rated
1 – Present in Planning Area but not recorded in WA Herbarium

APPENDIX 6: Guiding Principles for Fire Management in spinifex grasslands of Western Australia

Fire management is based on the following scientific principles (adapted from Burrows 2004).

- Climate and vegetation make landscapes dominated by spinifex grasslands highly prone to fire. For thousands of years, lightning and human ignitions have ensured that fire is an environmental factor that has influenced the structure and biodiversity of spinifex grasslands.
- Species and communities vary in their adaptations to, and reliance on fire. Knowledge of the ways in which species and communities respond to fire, and of the temporal and spatial scales of fires in relation to life histories of organisms or communities, underpins the use of fire.
- Rainfall is the primary driver of the rate of fuel accumulation and subsequent flammability of spinifex grasslands and large, extensive wildfires are usually preceded by several seasons of above average rainfall.
- The response of species and communities to fire will be influenced by the scale and patchiness of fire and by antecedent rainfall, which can drive systems towards a new transient state with respect to species composition and structure.
- Fire management is required primarily to conserve biodiversity. In some circumstances, it may be necessary to manage fire to protect property, infrastructure and cultural values.
- Fire management should be both precautionary and adaptive, considering the requirements of both fire sensitive and fire maintained communities and species in order to optimize biodiversity conservation outcomes.
- Landscapes dominated by spinifex grasslands are vast, remote and difficult to access. Fire management resources are scarce, so active fire management including fire suppression and prescribed burning, should focus on areas of high conservation value and on high value built and cultural assets. On much of the spinifex grasslands, passive management, including allowing unplanned (by the Department) fires to burn, is a realistic and acceptable management option.
- Fire diversity can support biodiversity both at landscape and local scales. At the landscape scale, a fine grain mosaic of patches of vegetation representing a range of interlocking seral stages will provide diversity of habitats for organisms that are mobile and can move through the landscape. At the local scale, appropriate intervals between fire based on vital attributes of key species are necessary to ensure the persistence of sessile or less mobile organisms.
- Avoid applying the same fire regime (frequency, interval, season and scale) over large areas for long periods and avoid seral and structural homogenization by not treating large areas with extreme regimes such as sustained frequent burning or infrequent burning.
- The scale or grain size of the mosaic should a) enable natal dispersal, b) optimize boundary habitat (interface between 2 or more seral stages/fire boundaries), and c) optimize connectivity (ability of keystone species to migrate between seral stages.
- A sequence of 2-3 years or more of above average rainfall will result in rapid growth of spinifex and flammable soft grasses, predisposing landscapes to large wildfires capable of burning through fire mosaics. While such events are infrequent, strategic low fuel buffers 500-1000 m wide may be required to contain wildfires under these conditions.
- All available knowledge including scientific, local and Indigenous knowledge should be utilized to develop ecologically appropriate fire management.
- Consultation and partnerships with neighbours, including Traditional Owners, is an effective way of managing fire for mutual benefit.
- Fire management should be planned and implemented in an adaptive management framework. Use of tools including remote sensing and aircraft, will be essential for planning and implementing fire use and for mapping and monitoring fire mosaics and fire history.
- As part of an adaptive management framework, biodiversity monitoring should focus on, in order of priority; a) threatened species and communities, b) fire sensitive species and communities and c) the remaining biota.
- Where Spinifex grasslands have been invaded by flammable weeds species such as buffel grass, which is capable of adversely altering the frequency and intensity of fire, prescribed burning should be used conservatively and strategically to break up the run of major wildfires.

APPENDIX 7: Visitor Management Settings Criteria#

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	1B – 'Surrounding areas'				A	B
Principle purposes	Maintaining and restoring the integrity of ecological processes and natural landscapes, maintaining and restoring biodiversity, and maintaining opportunities for solitude by maintaining or restoring the highest degree of apparent and biophysical naturalness and remoteness from permanent modern structures (*refer to Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)	'Surrounding areas' provide a buffer to wilderness areas and will be managed to support wilderness values. Conservation of significant natural and cultural values, with low level recreation	Conservation of significant natural and cultural values, with low level recreation	Conservation of significant natural and cultural values, with low to medium level recreation	Provides for moderate intensity recreation in a mostly natural landscape.	High-level recreation, education and interpretation. Group activities specifically catered for at many sites.	
Description	Natural areas with an NWI rating of >12 or greater. Wilderness areas are large, remote areas (8000 ha in temperate areas, 20 000 in arid, semi-arid and tropical areas of the State), with minimal evidence of modern human activity (*refer to Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	Provides a buffer to wilderness areas that will assist in maintaining wilderness values in adjacent areas.	Remote areas with conservation significance. Some evidence of previous development in process of rehabilitation, or existing human activity related to management tracks/trails, designated 4WD tracks and walking tracks	Modified environment but dominated by natural vegetation and landscapes conservation significance. Signs of past use evident	Areas with 'natural' landscape values. Exotic vegetation may be present but rarely dominant, recreation facilities present.	Includes concentrated areas of modified environment with natural background. Human activity conspicuous. High likelihood of non-natural, regular background noise. High level of site hardening and provision of facilities evident, frequent staff presence. Emphasis on interpretation and education at many sites.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	1B – 'Surrounding areas'				A	B
Access (access standards and type of transport used by visitors, resource users and protected area managers)	Vehicles: use of any form of mechanised transport is not permitted within wilderness, except for emergency or essential management operations, or reasons of cultural importance. Walk: constructed walking tracks, signs, track markers and toilets will not be permitted in wilderness, and walking access is via natural routes. AS Walking Track standard 6 only. Existing vehicle tracks and built walking tracks within wilderness, other than those required for emergency and essential management purposes, will be closed. Aircraft: landing of non-fixed wing aircraft is permitted for emergency and essential research purposes only. Flying under 2000 feet for fixed wing aircraft and 1500 feet for helicopters above wilderness is discouraged, except for emergency or essential research purposes. Existing vehicle tracks and built walking tracks within wilderness, other than those required for emergency and essential management purposes, will be closed.	**Vehicles: use of mechanised transport within areas surrounding wilderness will be permitted on designated access routes, and in other areas for emergency or essential management reasons only.** Walk: AS Walking Track class 5-6; tracks generally formed (class 6 tracks not formed)	Vehicles: 4WD only Walk: AS Walking Track class 4-6.; tracks generally formed (class 6 tracks not formed) Boats: non-motorised boats only Cycle: Horses: no horses permitted Airstrip: no airstrips permitted	Vehicles: 4WD, sometimes 2WD seasonal Walk: AS Walking Track class 3-5; tracks formed; Boats: boats, motorised and non-motorised, on designated routes/areas Cycle: types4 cycle trail Horses: designated bridle trails possible Airstrip: natural earth	Vehicles: 2WD unsealed Walk: AS Walking Track class 3 & 4; tracks generally formed; Boats: boats, motorised and non-motorised, on designated routes/areas Cycle: types 2 & 3 cycle trails Horses: designated bridle trails possible Airstrip: unsealed	Vehicles: 2WD sealed Walk: AS Walking Track class 1 & 2; tracks well constructed; universal access provided where appropriate and practical Boats: Areas may be open to all types of boats Cycle: type 1 cycle trails Horses: designated bridle trails possible Airstrip: sealed	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	1B – 'Surrounding areas'				A	B
Site modification (Extent, type and design of infrastructure, facilities, amenities and the style of accommodation provided)	No site modification and no facilities or structures except for reasons of visitor safety, resource protection and/or management operations. Any rehabilitation or repair of worn trails or sites is unobtrusive, with no long-term or permanent marking or hardening of trails or sites. Overnight Stays: campsites not defined but includes 'Wild' or 'Remote' camping Day Use: day use sites not defined Walk: walking tracks are not defined	Services and infrastructure adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of such areas should be avoided where possible. Overnight Stays: campsites not defined Day Use: day use sites not defined	Minimal modification at sites Overnight Stays: 'No Facilities' level of development; campsites not defined Day Use: Car parking not defined Facilities: No facilities provided	Minor modifications at specific sites Overnight Stays: 'Medium' and 'Low' level of development; campsites generally defined Day Use: Car parking generally defined Facilities: Basic facilities may be provided such as shade shelters, BBQs, toilets	Modification of sites clearly evident Overnight Stays: 'Medium' level of development; campsites generally defined Day Use: Car parking generally defined Facilities: Facilities generally provided such as shade shelters, gas BBQs, tables, toilets	Modification of site evident Overnight Stays: 'High' and 'Medium' level of development; may include built accommodation Day Use: Car parking has defined bays Facilities: High level of facilities including shade shelters, gas BBQs, tables, toilets, visitor information, rubbish collection; visitor centres may be present	Modification of site evident with permanent, commercial infrastructure such as shops, café's, accommodation present
Social interaction (Density of users and degree of social interaction and opportunities for solitude)	Interaction between users is minimal, with usually less than two other groups encountered during a day, and no other groups within sight or sound at campsites. Maximum group size of about six to eight people.		Little interaction between users, with small numbers of brief encounters with individuals or small groups only except at campsites.	High likelihood of contact with individuals and small groups along access routes and at campsites.	High level of contact with others at campsites and along access routes. Campsite design allows for group camping.	Constant interaction expected. Group and family activities important part of visitor experience. Interaction with others unavoidable. Natural setting important but in the security of a safe and managed environment.	
Degree of self reliance (level of support services)	Visitors must be totally self-reliant as support services are inappropriate and are not provided (except where necessary to protect wilderness values). Commercial tourism and recreation operators not permitted in wilderness.		Visitors must be totally self-reliant. Support services infrequent or unreliable.	Visitors must still be largely self-reliant. Basic support services provided in specific locations.	Self-reliance requirements are generally low where facilities are provided, but outdoor skills will be important in areas away from roads and tracks.	Minimal self-reliance. High level of support facilities usually present or in close proximity.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	1B – 'Surrounding areas'				A	B
Style of visitor management (level of on-site management, site constraints and regulations)	*On-site visitor management is very low with controls primarily off site.* *All interpretation is off-site; no trail information in brochures.* *Boundary signage only.* *Very infrequent ranger presence.* *Constraints on visitors may apply to areas subject to resource use.* *Surrounding areas to be managed to complement wilderness and provide a buffer.* Wherever possible, ground disturbing activities required for fire management will be conducted outside of wilderness. This includes construction and maintenance of access roads, firebreaks, fuel-reduced buffers and water points. Prescribed burning within wilderness may be carried out for the protection and maintenance of ecological values and processes as determined through the preparation of area and regional management plans and interim management guidelines.	Activities, including services and infrastructure, adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of these areas should be avoided where possible (such activities are not be permitted within wilderness).	Infrequent DEC presence. Information principally off-site (e.g. brochures, guides, maps); minimal signs Low maintenance	Some management presence including visits by DEC staff and signs. Information may be provided on-site Permit system may be used to control access; emphasis on establishing appropriate visitor expectations and behaviour	May be frequent ranger presence Interpretive material, brochures and track guides available Moderate on-site management requirements, including signs and barriers; facilities may be common but clustered	Frequent staff presence, on-site manager Could be interpretative and education focus High degree of on-site management including use of physical barriers and on-site staff; vehicle and pedestrian movement heavily controlled	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	1B – 'Surrounding areas'				A	B
Interpretation facilities and services	Signposting not provided on site, although some information provided off-site (e.g. websites, books, DEC offices).	Signposting often not provided but may be at start of pedestrian tracks and/or may be noted on wilderness interpretive signposting (located in 'surrounding area').	Signposting may be provided at trailheads; track markers and signs may occur for public health or safety reasons (e.g. at track junctions) Some guided tours may be permitted (see below)	Signposting may be provided where necessary Interpretive material off-site or at trailheads; guided tours permitted	Well signposted at trailheads and along track; Interpretive shelters, displays and leaflets, guided tours may be provided Primary themes may be expressed at recreation sites Extensive range of opportunities	Well signposted at trailheads and along track Interpretive shelters, displays and leaflets, guided tours may be provided; visitor centre may be present Primary themes may be expressed at recreation sites Extensive range of opportunities	
Commercial uses	Commercial recreation and tourism operations are not permitted within wilderness (*see section 4.3 of Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	All tourism management operations will be carried out in a manner consistent with maintaining the qualities of wilderness. CTOs permitted, but may need to consider restricted licences to maintain adjacent wilderness qualities (E class).	CTO licences permitted, but may consider regulating numbers to maintain visitor experiences consistent with setting (E class). Focus on nature-based/cultural activities. (leases?)	CTO licences permitted with focus on nature-based/cultural activities. (leases?)	CTO licences permitted, nature-based/cultural and adventure activities. (leases?)	CTO licences permitted, nature-based/cultural and adventure activities. (leases?)	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	1B – 'Surrounding areas'				A	B
Probable recreation experiences	Opportunities for isolation, independence, closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge. Educational and/or recreation expeditions will be permitted within wilderness providing they are consistent with the maintenance of the qualities of the area and operate according to the CALM's code of ethics (*see Attachment 2 of Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	Activities adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of such areas should be avoided where possible, and all recreation and tourism management operations will be carried out in a manner consistent with maintaining the qualities of wilderness.	Opportunities for solitude, independence, closeness to nature, tranquillity and self-reliance in an environment that offers a high degree of challenge. Although the activity may not be based on the use of a motorised vehicle, the influence of vehicles and the safety afforded by them may be significant.	Opportunities for challenging interaction with nature using outdoor skills. Opportunities may have human elements but still high probability that visitors can experience isolation from human influences.	Opportunities to interact with nature while still having access to facilities. Interaction with others expected.	Opportunities for nature appreciation and social interaction in a safe environment. Interaction with others unavoidable. Facilities support group activities.	

*Wilderness areas are classified under section 62(1)(a) of the *Conservation and Land Management Act 1984* to establish management zones to which specific management prescriptions or regulations apply.
Sources: Department of Conservation and Land Management, Policy 62 – Identification And Management of Wilderness and Surrounding Areas, The Recreation Opportunity Spectrum (Clark and Stankey 1979)

[#]These criteria apply across the whole State. Consequently, some criteria may not apply in the Shark Bay area

APPENDIX 8: Department Classification of Walk Tracks

Class	General Description	Physical Characteristic
1	Class 1 tracks provide an opportunity for most visitors, with no previous experience, including those with reduced mobility, to complete a walk on the track. Users may have abundant opportunities to learn about the cultural and heritage values of the track's environment through provision of interpretive signs. They will not need a map as arrow markers are present at all intersections and they require no special skills beyond normal care regarding their personal safety.	A hard surfaced track at least 1200mm wide, constructed to wheelchair standard where alternative ramp access must be provided if steps are present. Tracks are maintained regularly and have no obstacles or intrusions. Built facilities will include seats and lookout platforms and barrier rails where required.
2	Class 2 tracks provide an opportunity for many visitors, with no previous experience, to complete a walk on the track. Users may have many opportunities to learn about the cultural and heritage values of the track's environment through provision of interpretive signs. They and will not need a map as arrow markers are present at all intersections and they require no special skills beyond normal care regarding their personal safety.	A track with modified or hardened surface with a minimum width of 900mm, a maximum gradient of 1:10 and minimal steps. Tracks are maintained regularly and have no obstacles and minimal intrusions. Built facilities will include seats and lookout platforms and barrier rails where required.
3	Class 3 tracks provide an opportunity for visitors with a moderate level of fitness and a small degree of skill and self-reliance, to complete a walk on the track. Provision of interpretive information is not common but many opportunities will be available to observe and appreciate the natural and cultural environment of the track. A map is generally not required and directional markers and management signs may be present. Users are responsible for their own safety that could be affected by adverse weather conditions such as storms or extreme heat.	A track with a generally modified surface with a maximum width of 1200mm, where steps may be common and short sections may be steeper than 1:10. Track is kept mostly clear of obstacles and intrusions but they may be present. Where campsites are present toilets are required, but other structures and facilities are generally not provided except for environmental or safety reasons.
4	Class 4 tracks provide an opportunity for visitors with a higher level of fitness and specialised skills and self-reliance, to explore and discover relatively undisturbed natural areas on a distinct track. Only management and directional signs may be present there will be many opportunities to observe and appreciate the natural and cultural environment. Maps and navigational aids may be required and natural hazards are to be expected. Safety and navigation could be affected by storms, extreme heat or aridity.	A track with a generally unmodified surface with a maximum width of 1200mm that may have steep sections but no steps except for environmental reasons only and intrusions and obstacles may be common. Where campsites are present toilets are required, but other structures and facilities are generally not provided except for environmental or safety reasons.
5	Class 5 tracks provide an opportunity for visitors with high levels of fitness and advanced specialised outdoors skills and self-reliance, to find their way along, often indistinct, track in remoter natural areas. Only minimal management signage may be present. Maps and navigational aids will generally be required and natural hazards are to be expected. Safety and navigation could be affected by storms, extreme heat or aridity.	A track with a unmodified, often indistinct surface with a variable width less than 900mm that may have steep sections but no steps and where intrusions and obstacles are common. Where campsites are present toilets are required, but other structures and facilities are generally not provided except for environmental or safety reasons.
6	Class 6 routes provide an opportunity for highly experienced walkers with high levels of fitness and specialized outdoors skills and self-reliance, to navigate through remote, challenging natural and wilderness areas. Maps and navigational aids always required and natural hazards are to be expected. Safety and navigation could be affected by storms, extreme heat or aridity.	There is no modification of the natural surface and the route may have steep sections but no steps. No facilities are provided in wilderness areas, and toilets will only be provided where required for environmental reasons in other remote areas.

APPENDIX 9: Guidelines for Landscape Assessment

High Quality Visual Landscapes

- Alterations to the naturally established landscape character should be subtle, remaining subordinate to natural elements by borrowing extensively from form, line, colour, texture and scale found commonly in the surrounding landscape.
- Within 1 year of project completion, alterations should achieve a condition that is not visually evident, resulting in little more than natural change.
- Site specific visual landscape factors should be carefully identified and evaluated prior to any management activities such as developing new recreation sites, access tracks or conducting burning regimes.
- Facilities and activities which utilise and yet disturb very little of the natural environment should be encouraged such as walking tracks and small day-use areas.
- Land uses and developments, which do not require particularly scenic environments, should be excluded, this includes mining/quarries, large recreation sites, large car parks, roads, telecommunication towers and powerlines.
- Roads, recreation sites and walking tracks should focus views onto distinctive features by selecting optimum siting and alignment.
- Road design and construction should remain subordinate to landscape elements by utilising minimum design standards; limited cuts and fills, minimum clearing widths, undulating edges, sensitive alignment.
- Interpretive and explanatory signing should be utilised before and during operations that alter landscape character such as new recreation site development, control burning adjacent to travel routes and walking tracks.
- Where structures are required they should be sympathetic in design, materials and colour to complement surrounding landscape elements and be carefully sited away from major natural focal points, out of viewer sight-lines and where vegetation or landform screening can be used.
- Essential firebreaks should follow natural landform, vegetation, or land use patterns/lines in the landscape.
- Prescribed burning should be carried out employing prescriptions that minimise impact on landscape values.
- Previously disturbed areas within high scenic quality areas should be given the highest priority for rehabilitation until the desired standard of scenic quality is attained.

Moderate Quality Visual Landscapes

- Alterations to the naturally established landscape character should borrow form, line, colour, texture and scale from natural elements and may result in an apparent but not dominant impact found commonly in the surrounding landscape.

Low Quality Visual Landscapes

- Essential but visually depreciative facilities not requiring areas of scenic amenity should be accommodated in these areas first where possible such as gravel pits, quarries, mines, transmission and towers, powerlines.
- Enhancement of scenic quality through rehabilitation works should be considered to upgrade the area to a higher amenity standard.
- Views to disturbed landscapes may require landform and vegetation screening.

APPENDIX 10: Interpretive Primary Themes - Shark Bay World Heritage Property

Story	Themes
Global Community	**Shark Bay: its World Class** ❖ Shark Bay is one of the world's most outstanding natural areas: it is one of only 144 natural areas on earth with World Heritage Status, and of these one of only 16 that meet all four criteria for World Heritage listing. ❖ There are four key reasons for Shark Bay's World Heritage listing: modification of the marine environment by seagrasses, hypersaline seawater, Hamelin Pool stromatolites, and important cat and fox-free habitats for threatened species. ❖ World Heritage listing has had both positive and negative effects on the Shark Bay community: it has brought a small isolated community into the global tourist economy.
	Shark Bay: discover the earth ❖ Seagrasses are the "builders of the Bay": by creating an enormous expanse of banks and sills, seagrasses have profoundly changed the physical, chemical and biological nature of Shark Bay's marine environment. ❖ Shark Bay is home to the largest seagrass banks in the world: they are the foundation of the Bay's marine food chain, and are responsible for feeding most of the Bay's marine life. ❖ Shark Bay is one of the world's few hypersaline marine environments, thanks to seagrasses and an arid climate: hypersalinity has made Shark Bay an evolutionary and biodiversity hotspot. ❖ Shark Bay's unique marine environment has given rise to the world's most abundant and diverse stromatolites: these organisms tell the story of the evolution of life on earth. ❖ Shark Bay is a classic example of island biogeography: because of its many prongs, peninsulas and islands, many threatened and endemic species live here. ❖ Shark Bay was formed by a number of ongoing sedimentary and tectonic processes: deposition of dead marine life, weathering by wind and water, and shifting of the earth's crust. ❖ Shark Bay is Australia's largest marine embayment: its sheltered waters are home to abundant and diverse marine life, including one of the world's largest and most important Dugong populations. ❖ Shark Bay is a meeting place for tropical and temperate waters and desert and temperate botanical zones.
Indigenous	**Shark Bay: traditional home of the Malgana, Nanda and Yingkarta people** ❖ Gadhargudu (Malgana name for Shark Bay, translation: twin waters) is the traditional home of the Malgana, Nanda and Yingkarta people. ❖ Aboriginal people have lived in Shark Bay for thousands of years, adapting and shifting with changing sea levels and climate: they have borne witness to incredible changes wrought by time. ❖ Aboriginal people thrived in Shark Bay, moving with the seasons, but also maintaining permanent settlements at year-round water sources. ❖ Aboriginal people in Shark Bay were exposed to early European mariners: Aboriginal knowledge of country was essential to successful colonial settlement of Shark Bay. ❖ Contemporary Aboriginal people in the Shark Bay World Heritage area make significant contributions to the local economy, culture, businesses and conservation.
Maritime Explorers	**Shark Bay: a treasure trove of maritime history** ❖ The first known European landing in Australia took place on Dirk Hartog Island in 1616. ❖ Ships from around the world explored and exploited Shark Bay's resources, providing an early link between Shark Bay and the global economy.

Story	Themes
	❖ The first Australian plant and animal specimens brought to Europe came from Shark Bay, collected by early maritime explorers ❖ Shark Bay was considered by many early explorers to be a miserable and useless place, because they were unable to find water or fruit and vegetables to ward off scurvy, and because of the lack of trading opportunities. ❖ Shark Bay was one of the two best anchorages in WA, and a distinctive navigational feature for early maritime explorers, providing sheltered waters and abundant fish supplies.
Settlers	**Shark Bay: a microcosm of early Australian industry** ❖ Guano mining was Shark Bay's first industry: Shark Bay guano was considered among the best in the world, and was mined and exported by ships from around the planet. ❖ Pastoralism, sandalwood cutting, and telegraph communications were early industries in the Bay. ❖ Shark Bay's pearling and pearl shell industries were responsible for bringing global flavour to the Shark Bay community: Malays, Chinese, Koepangers, Afghans and Europeans intermingled to create the Bay's distinctive community. The pearlers moved around the Bay as they exhausted successive pearl beds. ❖ In its early days, Shark Bay was bustling with industry, and many more people lived here than do today: although it may seem like wilderness today, most of the Bay has been exploited by industry in some way or another. ❖ With the decline of the pearling industry, fishing became Shark Bay's dominant industry: in particular, a unique form of beach seine net fishing practiced by fishermen of Aboriginal-Malay descent. ❖ Townlife in Old Shark Bay: "we had nothing, but we had everything… we were free." ❖ Whaling was a major post-war industry in Shark Bay: Carnarvon's whaling station was responsible for a major portion of the international whale take. When the whales were exhausted, the industry was replaced by prawn trawling and crayfish harvesting. ❖ Shark Bay's unpolluted, hypersaline waters and shallow inlets led to the creation of a salt mining industry, creating salt using the same physical, chemical and biological processes which take place naturally in birridas.
	Shark Bay today ❖ Contemporary Shark Bay is a unique mix of Aboriginal, Malay, Afghan, European and other cultures that arose from years of relative isolation from the rest of the world - Shark Bay is special because these cultures peacefully coexist. ❖ Tourism is now the Bay's largest industry; Shark Bay's international status as a tourist destination has brought it from a period of relative isolation back into the global arena, as it was in the days of guano mining and pearling. ❖ Conservation and natural resource management in Shark Bay is based on extensive research, and is often globally ground-breaking.
Management	**Shark Bay: its in your hands** ❖ Shark Bay is in your hands - help keep Shark Bay world class by taking care of this fragile environment. ❖ Shark Bay's fish stocks are shared not limitless: help conserve fish for the future by fishing for a feed, not for the freezer.
	Shark Bay: yours to discover ❖ Shark Bay is an enormous 2.3 million hectare expanse of land and sea, encompassing a wide array of natural features and processes; its shear size can make discovering and managing Shark Bay challenging and difficult. ❖ Shark Bay is a spiritual place: share the passion residents feel for Shark Bay by discovering its subtle nuances and experiencing its changing moods.

20120050-0412-300