A Review of the Simpson Desert Regional Reserve 1988 - 1998

Department for Environment
Heritage and Aboriginal Affairs

This review has been prepared and adopted in pursuance of section 34A of the National Parks and Wildlife Act 1972

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS

ABS Australian Bureau of Statistics

ANU Australian National University

ANZECC Australian New Zealand Environment Conservation Council

CITES Convention on International Trade in Endangered Species

DEHAA Department for Environment, Heritage and Aboriginal Affairs

ESAC Endangered Species Advisory Committee

IUCN International Union for the Conservation of Nature

NPW National Parks and Wildlife

PIRSA Primary Industries and Resources, South Australia

SDCP Simpson Desert Conservation Park

SDRR Simpson Desert Regional Reserve

ACKNOWLEDGMENTS

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The steering committee comprising Colin Harris, John Watkins, Alex McDonald and Jenny Bourne provided valuable guidance, insights and information.

Other people within the Department for Environment, Heritage and Aboriginal Affairs who provided assistance, information or services were Benita Richter, Bernice Cohen, Brenton Arnold, Stephen Arnold, Pearce Dougherty, Wendy Smith, Robin Young, Mark Wilson, Jeff Foulkes, Peter Canty, Helen Owens, Robert Brandle, Vlad Potezny, Laurie Haegi, Bill Barker, Peter Campaign and Hamish Angas.

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Other stakeholders, individuals and organisations with either a direct or indirect interest in the management of the Simpson Desert Regional Reserve and who have provided either written or verbal information and opinions integral to this report are all listed in Appendix A.

FOREWORD

The first two Regional Reserves proclaimed in South Australia in December 1988 under the provisions of the *National Parks and Wildlife Act 1972* inaugurated a mechanism to protect areas of natural habitat while still allowing use of the natural resources of those areas to continue. The International Union for the Conservation of Nature (IUCN) recognises this category of reserve (Category VI) as an 'area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time sustainable flow of natural products and services to meet community needs'.

The proclamation of the Simpson Desert and Innamincka Regional Reserves recognised conservation as a land use over two significant parts of the arid zone of South Australia. For the first time in this State and arguably Australia, multiple-use reserves had been formally dedicated, providing a means to put management agreements in place and to take shared responsibility for outcomes that have the potential to benefit all South Australians.

To achieve this goal to the fullest extent, partnerships need to be developed between the Government and the users of the natural resources of those reserves. In the case of the Simpson Desert Regional Reserve, however, the stakeholders involved in petroleum exploration and production have not been active in the past decade and there has been little opportunity to form such a partnership. On the other hand, the petroleum exploration work undertaken during the decades immediately prior to reserve proclamation has left a legacy of seismic tracks that have created an interest and provided a means of access to the Simpson Desert for increasing numbers of visitors with 4WD vehicles.

The *National Parks and Wildlife Act 1972* requires a report to be prepared on each regional reserve at intervals of no more that ten years and prescribes the assessment criteria. This report reveals that while the Simpson Desert Regional Reserve has generated only a modest economic benefit for South Australia, reserve status has provided a stimulus for tourism activity and the regional economy, improved environmental management and links with the community. In particular, the efforts of the Friends of the Simpson Desert, who organised voluntary cleanup projects in 1992 and 1998, are to be commended.

The report indicates that the impacts of resource use on both the natural values and the economy of the State have been minimal in the period under review. While preparation of a plan of management that sets out specific objectives, environmental guidelines and economic indicators for future assessments of management performance has been identified as a priority, I believe the report reveals that management has largely met the IUCN objectives, justifying the original decision to establish the reserve and for its continued existence.

The Simpson Desert Regional Reserve is one of a series of adjoining reserves in the Far North of South Australia the management of which is inextricably linked. I look forward to the community's ongoing support in the future management of reserves of the Simpson Desert. In accordance with the provisions of Section 34A (5) of the *National Parks and Wildlife Act 1972,* I have much pleasure in presenting this report on the use and management of Simpson Desert Regional Reserve to Parliament.

HON DOROTHY KOTZ MP
MINISTER FOR ENVIRONMENT AND HERITAGE
MINISTER FOR ABORIGINAL AFFAIRS

1 EXECUTIVE SUMMARY

The Simpson Desert Regional Reserve was constituted as a reserve under the *National Parks and Wildlife Act 1972* on 22 December 1988. This reserve classification allows the Government to manage land for conservation of wildlife, and natural and historic features, whilst at the same time, permitting utilisation of natural resources, thereby enabling multiple land use of the reserve.

Based on the available information, the impacts, positive or negative, on wildlife and natural and historical features of the Simpson Desert Regional Reserve appear to have been insignificant in the period since proclamation.

There has been no petroleum exploration or production in the Simpson Desert Regional Reserve since proclamation. The only activity in the region has been the construction of two exploratory wells, one in the Simpson Desert Conservation Park in 1989 (*Poolowanna 3*) and the other to the south of the Simpson Desert Regional Reserve in PEL 50 (*Lake Kool 1*). Hence, there has been no impact of the utilisation of the petroleum resources on the conservation of the wildlife and natural features of the reserve.

Tourism and recreation activities in the Simpson Desert Regional Reserve have increased in the past ten years, and as a result, there has been an increase in the utilisation of the reserve's natural resources. Since the cessation of petroleum exploration activity, and the restrictions on access to many of the original seismic exploration tracks, the natural processes of revegetation have been significant. In this climate of steadily increasing tourism activity, accompanied by the regeneration of much of the area covered by the Regional Reserve, it appears that even increasing visitation is not having significant impacts, positive or negative, on the natural features of the Simpson Desert Regional Reserve.

In economic terms, the net value to the State of the Simpson Desert Regional Reserve being managed and administered as it has since 1988 is $980 000 per annum. This equates to only about 0.003% of the annual State gross product, but 5% of the total regional employment. The intangible future value of management and research is not included in these estimates.

In terms of tourism and recreation, business turnover (equivalent to the total income to tourist businesses) is estimated to be $2.27 million, value added (expenditure by visitors) is estimated to be $980 000, employment (jobs created) 21, and household income (salary/wages for jobs created) $500 000 annually.

The recommendations are that:

- The Simpson Desert Regional Reserve remain in the National Parks and Wildlife reserve category of Regional Reserve.
- A plan for the management of the area be formulated, with clear objectives and clearly defined environmental and economic indicators which are adequate for future assessments of management performance.

2 INTRODUCTION

2.1 Regional Reserves

The *National Parks and Wildlife Act 1972* provides for the establishment and management of reserves for public benefit and enjoyment, to provide for the conservation of wildlife in a natural environment, and for other purposes. These reserves fall into five categories namely, National Parks, Conservation Parks, Recreation Parks, Game Reserves and Regional Reserves. The *National Parks and Wildlife Act 1972* applies to all reserves constituted under the Act.

Regional Reserves proclaimed under Section 34A of this Act and managed pursuant to Section 37 Objectives of Management also provide for the conservation of wildlife or the natural or historic features of that land while, at the same time, permitting the utilisation of the natural resources of that land.

2.2 Background to Regional Reserves

Regional Reserves are the direct result of a desire by government to have conservation recognised as a major land-use of public land while permitting the use of natural resources of those lands.

The original *National Parks and Wildlife Act* in 1972 provided for reserves under that Act with two major roles; conservation of natural and historic features and public benefit and enjoyment. The Act did include provisions to permit mining access in reserves, but prior to 1985 this provision was rarely implemented. Government policy adopted in that year has resulted in almost all new reserves being proclaimed with provision for mining access.

The *National Parks and Wildlife Act 1972* was amended in 1987 to make provision for multiple use reserves by creating a new classification of Regional Reserve. The constitution of these reserves aimed to provide the government with an opportunity to exercise a management regime that would maximise the conservation of key biodiversity assets while allowing for pre-existing and future land use such as mining and pastoralism.

Furthermore, this permitted the Government to develop partnerships with the mining and pastoral industries thereby facilitating improved standards of ecologically sustainable development. Quite apart from the projected improvement in the overall management of lands of such reserves, the philosophy behind the regional reserve concept was expected to filter through to the broader management community operating in similar environments. The intention was that, together with the national land care strategy and the establishment of best practice environmental codes of practice by major mining companies, a more sustainable approach to land management generally would ultimately develop in these areas.

There was a view that the Regional Reserve concept compromised the significance of conservation and appeared incapable of adequately addressing the protection of the highly significant areas. In view of this it was argued that pre-existing industries should be excluded from the most significant conservation areas of reserves, such as the Coongie Lakes Wetlands within the Innamincka Regional Reserve.

It needs to be stressed that the establishment of the Regional Reserve classification was aimed at facilitating the only available and realistic opportunity for conservation as a legitimate land use, to sit alongside mining and pastoralism.

The Regional Reserve model was seen as having other benefits. It created a context within which resource usage industries would operate in a conservation framework. It was never intended that the model could, or would, be used as a vehicle for conservation interests to exclude the interests of other land users. If decisions are to be taken subsequently that result in the discontinuation of one or more land uses, such decisions would be based on contemporary judgements taking into account prevailing economic, environmental and social considerations.

Regional Reserves fall into IUCN Category VI Protected Areas which is defined as '*areas containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs*' (IUCN 1994). The key words here are **sustainable** with respect to production objectives, and **protection and maintenance** with reference to biological diversity.

The Regional Reserve classification is not fixed, as it does not prevent all or part of such a reserve from being re-constituted as another class of reserve under the Act at some future date, subject to a resolution of both Houses of Parliament.

Over the last ten years the *National Parks and Wildlife Act 1972* has provided a multiple land use management regime within a conservation framework for defined areas that have conservation values but are subject to other legitimate land uses. The Regional Reserve mechanism provides for:

- a conservation focus
- conservation management planning and implementation
- security of tenure for lands reserved under the Act
- managed utilisation of natural resources, and
- regulation for the management of human activity.

The major challenge for regional reserve management is to establish strategies that successfully integrate the different uses for which a reserve has been set aside. These strategies would require evaluation in a management plan.

The *National Parks and Wildlife Act 1972* also provides for agreements between the Minister for Environment and Heritage and Minister for Primary Industries, National Resources and Regional Development, and holders of mining tenements to prescribe the way in which natural resources will be utilised in regional reserves. These agreements recognise, and make provisions for protecting the conservation values of these lands.

All other provisions of the Act apply to Regional Reserves.

2.3 Purpose of this Review

This is a Ministerial Review required pursuant to the *National Parks and Wildlife Act 1972* Section 34A(5).

The Minister must within ten years of the constitution of a Regional Reserve:

(a) prepare a report :
  (i) assessing the impact of the utilisation of natural resources on the conservation of the wildlife and the natural and historic features of the reserve,
  (ii) assessing the impact or the potential impact of the utilisation of the natural resources of the reserve on the economy of the State, and
  (iii) making recommendations as to the future status under this Act of the land constituting the reserve, and

(b) cause a copy of the report to be laid before each House of Parliament.

2.4 Interpretation

In undertaking the review, it has been necessary to ensure that the requirements of the Act are properly addressed. To facilitate this process, an interpretative analysis of Section 34A of the Act was conducted and is provided in Appendix N. This analysis has been used to guide the conduct of the review. It is also useful in guiding readers of the report.

During the conduct of the review, issues emerged that will need to be addressed in the ongoing management of the Reserve. Some of these relate to the scope and quality of baseline data upon which critical analysis of management should rely and which will be essential for the conduct of future Section 34A reviews. Other issues relate directly to the standards and aspects of management that need to be addressed on an ongoing basis.

Recommendations for management, whilst not a requirement in the context of the Section 34A review, are included in this report for the purposes of foreshadowing those issues that will be need to be addressed in formulating a plan of management for this Reserve.

2.5 Scope of this Report

As indicated in 2.3 above, this review has been prepared to meet the purposes of Section 34A(5) of the *National Parks and Wildlife Act 1972.*

Chapter 3 provides a description of the location, landscape, wildlife and cultural features of the reserve, and an overview of the natural resource utilisation which has occurred within the reserve over the review period.

Chapter 4 provides a discussion and assessment of the impacts of resource utilisation on the natural features of the reserve.

Chapter 5 discusses and assesses the impacts of resource utilisation on the cultural features of the reserve.

Chapter 6 provides a summary of the assessment of the impacts and potential impact of resource utilisation on the economy of the State.

Chapter 7 presents brief conclusions and discussion of the major utilisation issues.

Chapter 8 sets out the recommendations regarding the future status and management of the reserve.

Appendix A provides a list of stakeholders contacted during the preparation of this review.

Appendices B to F provide lists of plant and animal species known to occur within the Reserve and current endangered species recovery plans.

Appendices G to L provide a discussion of multiple use conservation areas, land system descriptions, and regional contextual background on introduced mammals, petroleum exploration and tourism.

Appendix M is the Economic Assessment Report prepared by Econsearch Pty. Ltd.

2.6 Review Process

The data used in compiling this report has been drawn from existing monitoring programs, audit reports and relevant research. In particular, data on developments and audits of seismic activities held by Primary Industries and Resources South Australia (PIRSA) Petroleum Division have provided an assessment of impacts of petroleum exploration activities. Impacts of tourism have been assessed using the knowledge of the Department for Environment Heritage and Aboriginal Affairs (DEHAA) National Parks staff and information obtained from discussions with tourism operators and local businesses. Further information was sought from other areas within the Department for Environment, Heritage and Aboriginal Affairs and Tourism SA.

The impact of the utilisation of the resources of the reserve on the economy of the State was assessed and reported on by Econsearch Pty Ltd.

Over 60 Stakeholders have been involved. Letters to key stakeholders and individuals sought input to the review, and meetings with key stakeholders covering the key topics of the review were conducted.

This report is based on the available data, none of which was originally collected specifically for the purpose of indicating trends or changes in natural or cultural features of the Simpson Desert Regional Reserve.

3 SIMPSON DESERT REGIONAL RESERVE - OVERVIEW OF THE AREA

The Simpson Desert Regional Reserve is situated in the remote north of South Australia (Figure 1) abutting the Witjira National Park and surrounding Simpson Desert Conservation Park on three sides. The Simpson Desert, as a whole, extends into the Northern Territory and Queensland. Though surrounded by working pastoral properties, cattle have never been commercially run in the dunefields of the Simpson Desert. After extensive rains, they have been known to stray into the desert margins.

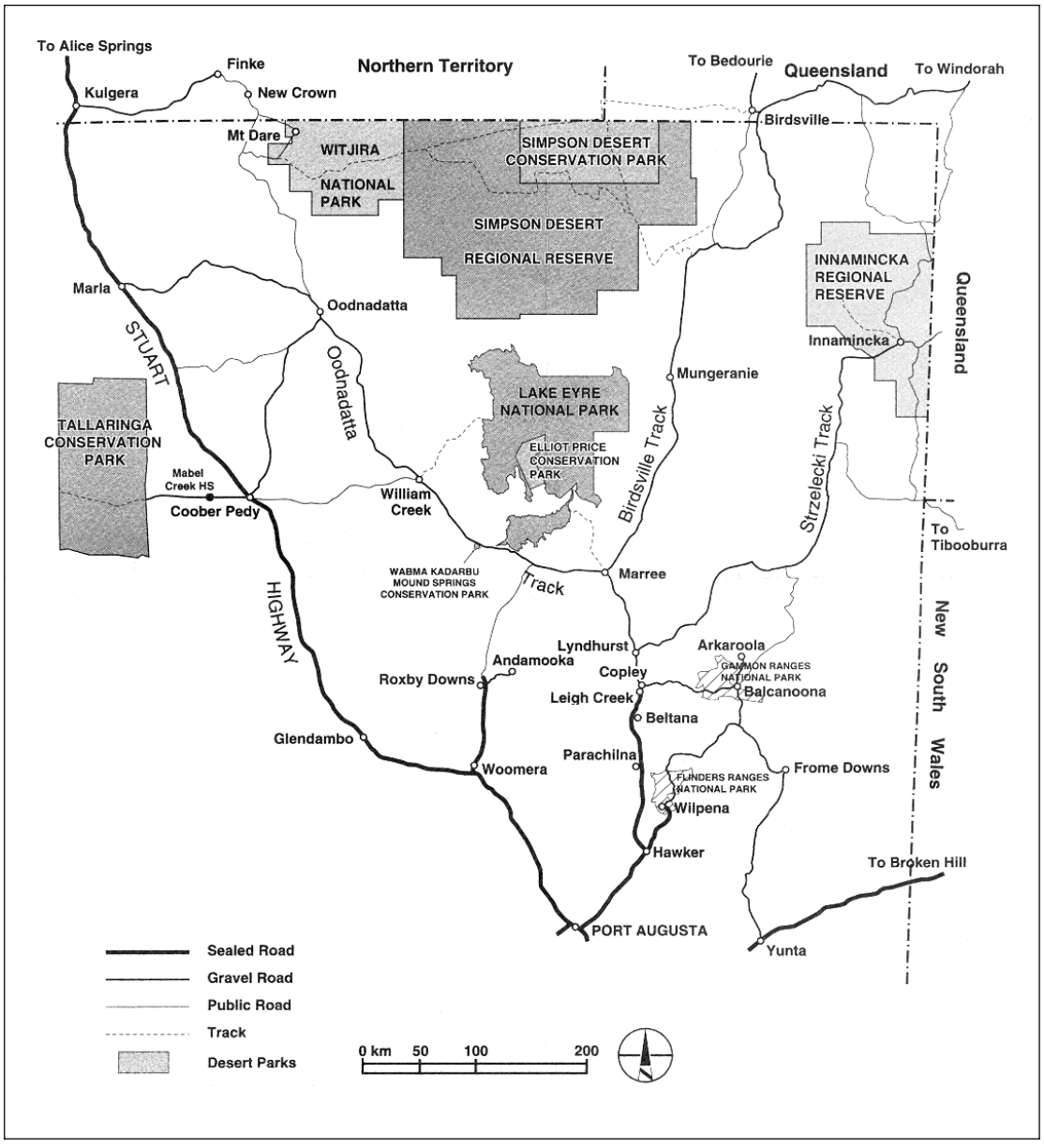

Figure 1 Location - Simpson Desert Regional Reserve and regional landmarks in northeast South Australia

Many tracks were built in the region for petroleum exploration activities. Currently there is no petroleum exploration activity in the reserve, and vehicular access is restricted to the tracks shown in Figure 2.

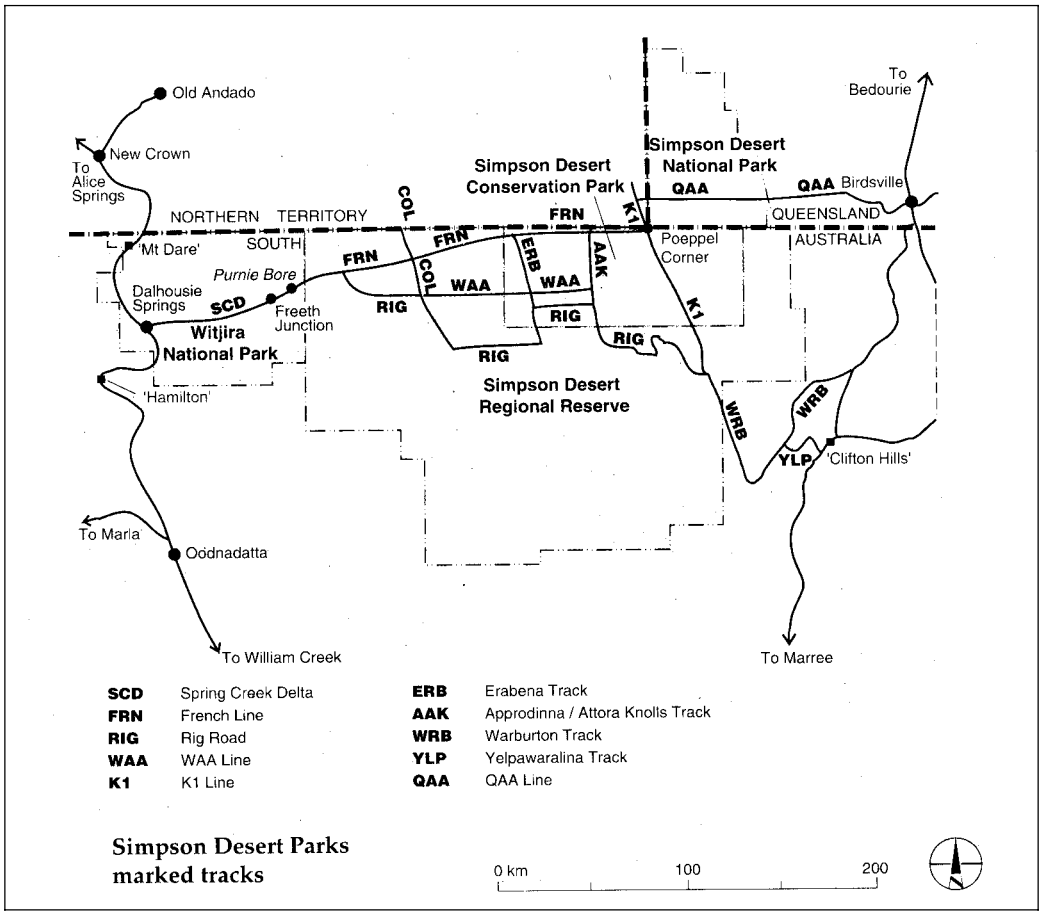

Figure 2 Marked vehicular tracks in the Simpson Desert Regional Reserve, Witjira National Park and Simpson Desert Conservation Park

3.1 NATURAL FEATURES

3.1.1 Landforms / Land Systems

Reports from the first scientific expedition into the Simpson Desert by Madigan in 1939 described the plant communities and landforms as a single complex (Crocker 1946). For some time, this description supported the perception that the Simpson Desert was ecologically uniform. Scientific research in the past 20 years has altered this view by highlighting the significant diversity of the various ecological systems.

The dunefields of the Simpson Desert can be divided into eleven major systems, four of which have some portion within the Simpson Desert Regional Reserve (Purdie 1984). A more popular classification is the use of ecological associations or land systems, which combine aspects of soil type, vegetation and landform (Graetz et al. 1982). The principal land systems (all of which are dominated by sand dunes) within the Simpson Desert Regional Reserve are the Wangkangurru, the Tirari and the Jeljendi (Figure 3). In addition, the Kallakoopah land system occupies a small portion of the southern Simpson Desert Regional Reserve (Marree Soil Conservation Board 1997). The dominant characteristics of these land systems are described in further detail in Appendix H.

The Simpson Desert Regional Reserve falls entirely within the Simpson-Strzelecki Dunefields bioregion (Thackway and Cresswell 1994), 23.7% of which is included in some category of conservation reserve in South Australia.

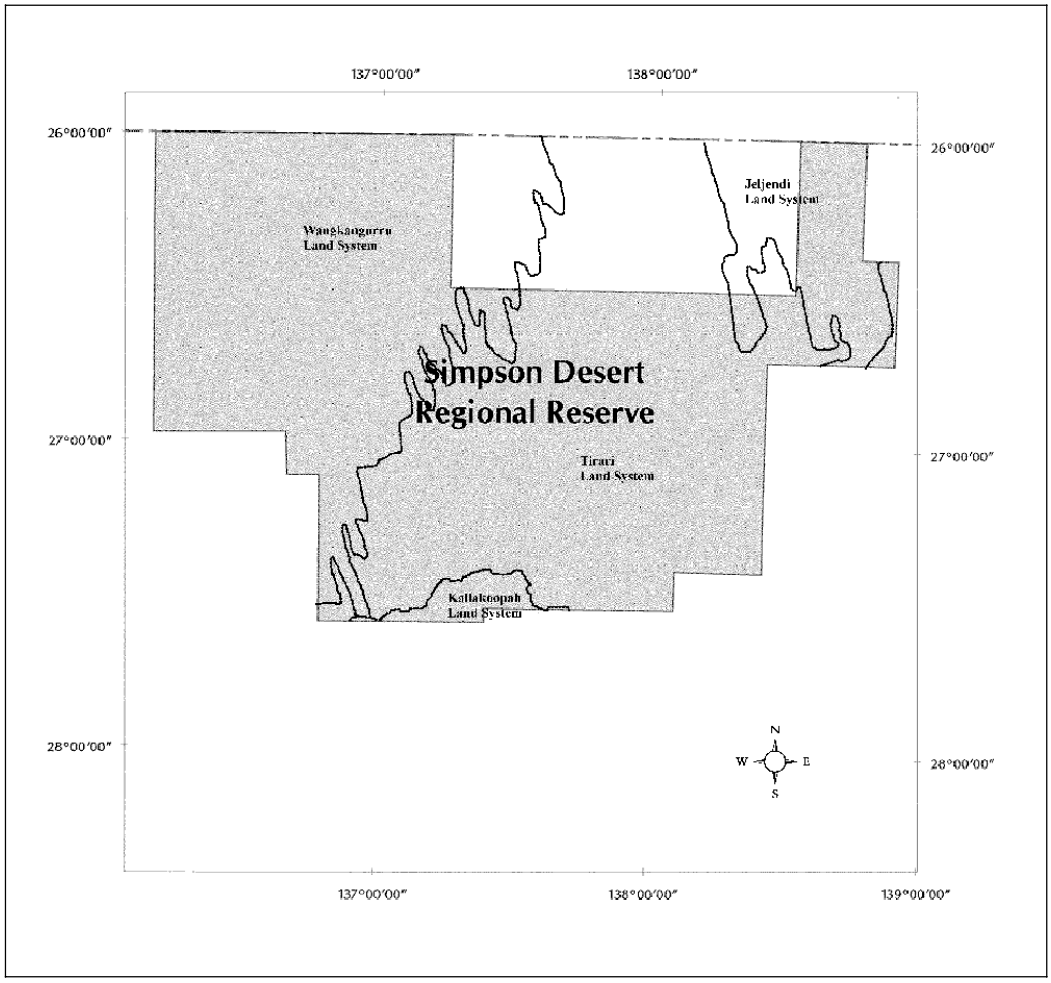

Figure 3 Land Systems of the Simpson Desert Regional Reserve

3.1.2 Biodiversity

The Simpson Desert is an ecologically diverse area. This is emphasised by the considerable variation in the community patterns of the regional flora and fauna. The organisms of the desert possess a suite of adaptations that enable them to survive fluctuating cycles of drought and rain. The remoteness and relative inaccessibility of the Simpson Desert has, until recently, restricted the amount of information collected on the resident flora and fauna, with only the bird and plant life being understood in any detail. Due to a lack of comprehensive biological survey data, it is difficult to establish the precise status of many flora and fauna species within the desert.

Within the area of the Simpson Desert Regional Reserve, in the time since proclamation, biological data collection has been undertaken by a variety of individuals and organisations. Most of this data, collected over a decade ago is relevant background information. The Biological Survey of South Australia will over the next several years obtain more information about the sandy deserts which include this reserve. The collated results (composite species lists) of these and earlier surveys are presented in Appendices B – E.

Flora

The first collection of plants from the Simpson Desert was made by Crocker in 1939 whilst on expedition with Madigan (Crocker 1946). This was added to by Symon (1969) who noted 180 species as occurring within the desert proper. Many more are found in the northeast and northwest of the desert, beyond the borders of the Simpson Desert Regional Reserve where there is greater habitat

diversity (Purdie 1984; Shephard 1992). A list of plant species positively identified as occurring in the southern Simpson Desert is presented in Appendix B.

The aridity, soils and landform restrict the diversity of plants in the central part of the desert. Plants persist in the desert by either tolerating drought (long-lived perennial plants), or taking advantage of unpredictable rain (short-lived opportunistic ephemeral or annual plants). The distribution of plant populations is locally and regionally variable and responds to changes in soil texture, moisture content and nutrient status (Buckley 1983).

The ratings for conservation threats are constantly being reviewed as more understanding is gained of plant distributions and the factors which determine them. A description of the ratings for threatened plants is included in Appendix B.

In 1983, only one species within the desert, *Calandrinia disperma*, was considered Rare (South Australian Department of Environment and Planning 1983). In comparison, there are now 13 species listed as Rare and two listed as Vulnerable (National Parks and Wildlife Act 1972 Schedules May 1991), which have been recorded in the Simpson Desert (Appendix B). The downgrading of *Calandrinia disperma* and the inclusion of these 15 species was a result of more detailed information being collected from this region.

The primary threat to vegetation in the Simpson Desert Regional Reserve is grazing by introduced herbivores, principally rabbits and camels. Pastoralism does not extend beyond the desert fringes and clearance of vegetation for other broadscale uses is not an issue.

The aridity of the desert prevents the spread of many of the exotic species originating from a Mediterranean climate. The percentage of exotic plants in the central Australian flora is low, about half that in higher rainfall areas of the continent (Buckley 1981), and visitor observations suggest that there are no significant exotic species within the bounds of the Simpson Desert Regional Reserve (Friebe and Friebe 1998). Potential for the spread of herbaceous and 'woody weed' species may be exacerbated by increased human use of the desert.

Birds

The first recording of birds from the Simpson Desert region was by Andrews from the desert fringes during the Lewis expedition of 1874 – 1875 (Shephard 1992). It was not until the period between 1969 and 1980 however, that a more comprehensive assessment, including sampling from the central dunefields, was undertaken. The collated data suggested that 132 species occurred within the region (May 1983). In comparison, combined data from the Simpson Desert Conservation Park Draft Management Plan, the South Australian Museum and the South Australian Environmental Database indicate a total of 156 species (Appendix C). This list does not differentiate between those birds which are seasonally present, nomadic or permanent residents of the desert.

Of these 156 species, 52 are characteristic of wetland habitats, moving into the desert during periods of high rainfall or flying over the region between wetlands in adjacent areas. Species diversity is greatest on the floodplains bordering the watercourses and lowest in the central dunefields (Gibson and Cole 1988; South Australian Department of Environment and Planning 1983). Wetland species may occur in the desert during periods of high local rainfall or flooding. No introduced bird species are known to occur within the Simpson Desert (Appendix C).

The Simpson Desert provides habitat for six species of birds classified as vulnerable and three species classified as rare (South Australia 1972) (Appendix C). The Australian Bustard (*Ardeotis australis*), is listed as vulnerable, however the desert is able to maintain a moderate population of this species which has suffered a significant decline in numbers in the southern parts of its former range as a result of habitat modification and hunting pressure (South Australian Department of Environment and Planning 1983, Frith 1979).

The Night Parrot (*Pezoporus occidentalis*) is listed as Endangered by ANZECC and the *National Parks and Wildlife Act 1972*, and also classified as Priority A under the *Endangered Species Act 1992* (Commonwealth of Australia 1992). Whilst its potential geographical distribution overlaps a portion of the southeastern Simpson Desert (Simpson and Day 1996), the Night Parrot has not been positively sighted.

Native Mammals

The distribution of native mammal populations within the Simpson Desert is generally localised and patchy, making observation and data collection difficult. Biological surveys of the area were carried out in 1968 and 1972 by (Watts and Aslin 1974) and also by the Nature Conservation Society of South Australia (Foale 1982).

In a survey of the northern Simpson Desert in the Northern Territory, Gibson and Cole (1988) recorded 24 species of native mammals, seven of which were bats. In comparison, 19 species of terrestrial native mammals and three species of bats have been recorded in the southern Simpson Desert (Appendix D). Most species discovered in the northern Simpson Desert (Gibson and Cole 1988) are also expected to be found in the similar habitats of the Simpson Desert Regional Reserve (Kemper 1990). Up to 44 species may have originally inhabited the Simpson Desert (Gibson and Cole 1988). This number has been significantly reduced by numerous local extinctions since non-indigenous settlement. Losses have primarily been of medium-sized mammals with desert bandicoots suffering the most (Finlayson 1961). Extinctions are believed to be a product of the effects of introduced predators and herbivores superimposed onto natural cycles of changing rainfall and fire regimes (Burbidge and McKenzie 1989; Morton 1989).

Of the 19 terrestrial native mammals which have been positively recorded within the Simpson Desert, eight are classified as threatened (Appendix D). Recovery Plans formulated under the Endangered Species Protection Act 1992 are in place for the conservation of five of these species, the Mulgara (*Dasycercus cristicauda*), Ampurta (*Dasycercus hillieri*) (Priority B), Kowari (*Dasycercus byrnei)*, Plains Rat (*Pseudomys australis)* and the Dusky Hopping Mouse (*Notomys fuscus*). Whilst not being specific to the Simpson Desert Regional Reserve, Recovery Plans for the Ampurta and Mulgara may require some research effort in the region (Appendix F).

The precise status of many of the small native mammals within the desert is not well understood. Gibson and Cole (1988) suggested that many species have naturally low densities with their populations fluctuating in response to natural cycles.

Introduced mammals

There are nine species of introduced mammals recorded for the Simpson Desert (Appendix D). The most influential are the European Rabbit (*Oryctolagus cuniculus*) and the Arabian Camel (*Camelus dromadarius*). After the rabbit, the House Mouse (*Mus domesticus*) is the most common mammal in the desert. Feral cats were first recorded on the Field River (Simpson Desert National Park, Queensland) in 1884. The feral cat and fox are the principal introduced predators in the desert. Donkeys, horses and cattle may enter the Simpson Desert Regional Reserve but they are generally restricted to the desert margins and rarely enter the desert proper.

Reptiles

Little is known of the reptiles within the Simpson Desert Regional Reserve. Up until 1984, only 21 species had been observed in the desert proper (Walton and Richardson 1989). More recent surveys have increased this number to 55 (Appendix E). On the basis of geographical and habitat preference, a total of 92 species may occur within the desert and its margins, making the desert one of the richest environments for reptiles in arid Australia (South Australian Department of Environment and Planning 1983; Shephard 1992). None of the known or potentially-occurring species are considered threatened (Jenkins 1979), though the endemic Lake Eyre dragon (*Ctenophorus maculosus)* is restricted to Lake Eyre and surrounding salt lakes (Mitchell 1973). Whilst not having been recorded within the Simpson Desert, the distribution of this species may extend into the Kallakoopah Creek region in the southern Simpson Desert.

3.2 CULTURAL FEATURES

3.2.1 Aboriginal

The Register of Aboriginal Sites and Objects held by DEHAA lists 122 sites in the Simpson Desert Regional Reserve and Simpson Desert Conservation Park area. About two thirds of these are

mythological and ceremonial sites, and the remainder are archaeological and historical (Campaign 1998). The Division of State Aboriginal Affairs is currently engaged in Stage 2 of the Site Conservation Strategy for South Australia. This stage will attempt to verify locations and report on the status of all sites. The Simpson Desert area is yet to be visited.

There has been no active management of features of Aboriginal cultural value. Locations and details of items listed on the Register are not readily available to the public, and this has taken the pressure off the potential for vandalism or degradation through visitation. The impact on native wells (or soaks) has been minimal (Hercus 1998; Potezny 1998; Rowlands 1998). Whilst in use, the wells were constantly in need of management to allow access to the water, and through a lack of use, the natural process of drifting sand has filled many of them.

Later stages of the Site Conservation Strategy will determine appropriate management in consultation with the traditional owners.

Native Title Claims

At 30 September, 1998, two Native Title claims are pending over parts of the Simpson Desert Regional Reserve (Figure 4) from:

- the Wangkangurru / Yarluyandi People (SC 97/3)
- the Dieri Mitha Council (SC 95/2)

Processing these claims is being slowed by the fact that their areas overlap, and amendments to the *Native Title Act 1993* which came into effect on 30 September 1998 require some alterations to the legal processes.

The Dieri Mitha claim, covering approximately 120 000 km^2, was lodged on 16 January 1995, and referred to the Federal Court on 2 June 1998. It has undergone two 'Directions Hearings' and a third is scheduled for 14 December 1998.

The Wangkangurru / Yarluyandi claim, covering approximately 95 000 km^2, was lodged on 21 August 1997 and had not been accepted by 30 September 1998.

There are many legal processes yet to be traversed before either of these claims reach resolution. DEHAA expects to develop positive relationships with the traditional owners regarding the management of the reserve.

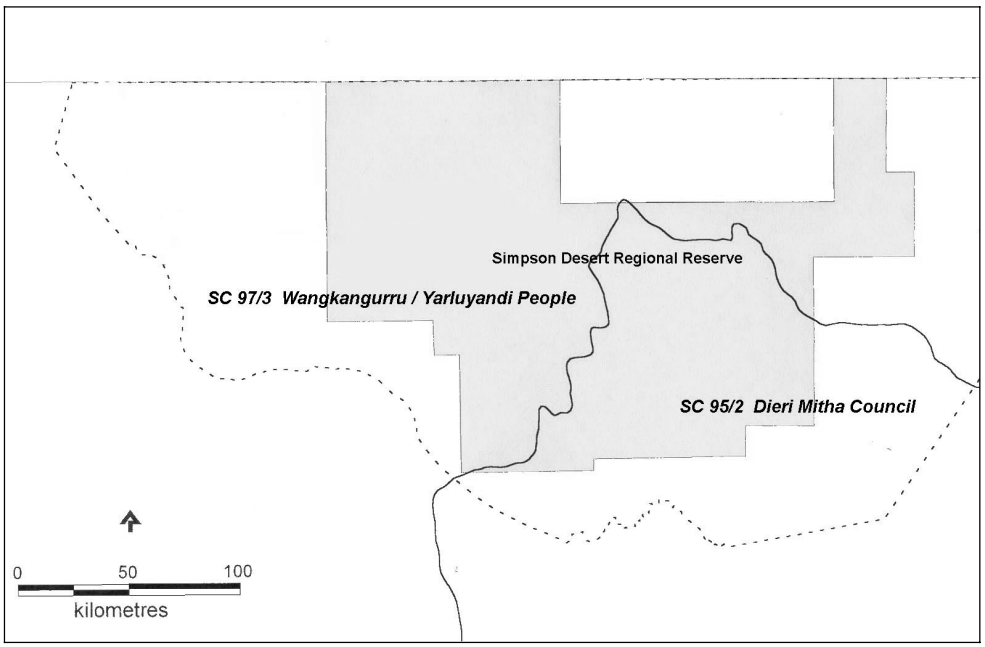

Figure 4 Native Title Claims in the Simpson Desert Regional Reserve

3.2.2 Non-Indigenous

A heritage survey of the Far North of South Australia, including the Simpson Desert region, is likely to be undertaken after the end of 1999. Whilst no features within the Simpson Desert Regional Reserve are currently entered in the State Heritage Register (Angas 1998), some elements of the earliest 1960s seismic exploration may be considered as features of non-indigenous cultural heritage at a later stage.

3.3 Resource Utilisation

3.3.1 Petroleum Exploration

Up until 1988, Delhi Australia Ltd. and Santos Ltd., under Petroleum Exploration Licenses (PEL) 5 and 6, had drilled a total of nine exploratory wells within the area now designated as the Simpson Desert Regional Reserve. Whilst Delhi-Santos surrendered segments of PELs 5 and 6 in north eastern South Australia on 23 November 1988, the portion of the license area which included the Simpson Desert Regional Reserve was not officially relinquished until 28 February 1990. Although no wells were drilled in the Simpson Desert Regional Reserve during this period, *Poolowanna 3*, located within the Simpson Desert Conservation Park, was completed on 5 March 1989. Drilling was allowed within the Conservation Park because of the pre-existing conditions relating to PELs 5 and 6. After the official relinquishment of a part of PELs 5 and 6 (Pedirka Sector), the Simpson Desert Conservation Park became a single use park.

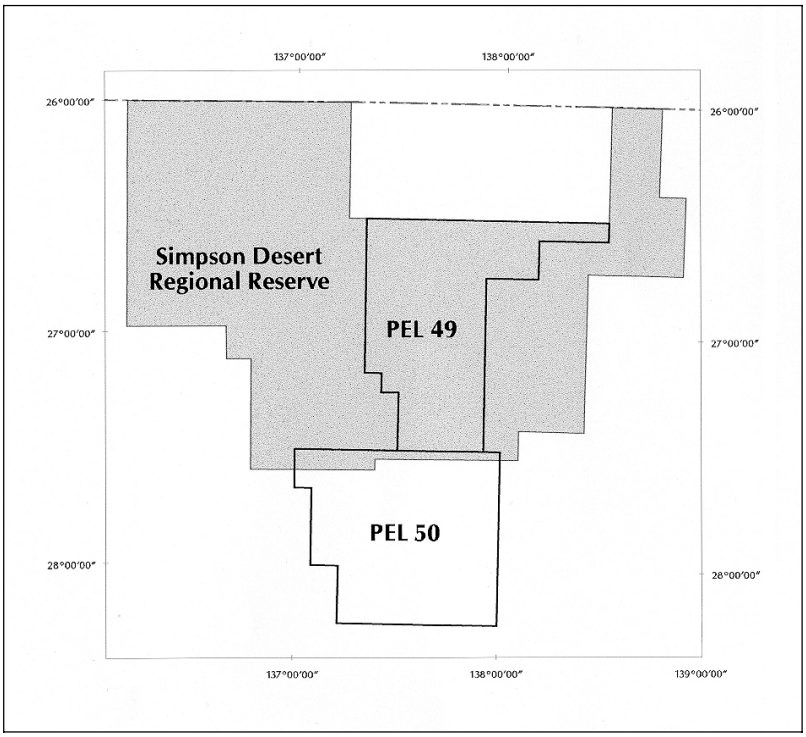

Figure 5 Petroleum Exploration Licenses 49 and 50

Part of the Simpson Desert Regional Reserve was covered by an exploration license on 1 July 1991, when Felstea Pty Ltd. was granted PELs 49 and 50. PEL 49 covers an area of 9 213 km^2 and is entirely located in the southern portion of the Simpson Desert Regional Reserve (Figure 5). PEL 50 covers 9 716 km^2, of which less than 5% lies within the Simpson Desert Regional Reserve. Up until the 30 June 1996, when PELs 49 and 50 expired, Felstea had carried out no work within the reserve. Under an agreement with PIRSA, this expiry date has been extended to 31 December 1998 (Cockshell 1998). One well was drilled in December 1997 in PEL 50, outside the Simpson Desert Regional Reserve, fulfilling the requirements of the operator's work commitment (Langley 1998).

3.3.2 Tourism and Recreation

There is general agreement amongst stakeholders that there has been an increase in the number of visitors to the Simpson Desert and hence the Regional Reserve in the past ten years. Signatures in the Visitors Book placed at Poeppel Corner by the Tamworth 4WD Club support this trend (Shephard 1992). A variety of surrogate measures are available to estimate absolute visitor numbers to the Simpson Desert Regional Reserve. Econsearch (1998) estimates approximately thirty three thousand vehicles or approximately ten thousand people traverse the desert annually.

A demographic profile of visitors to the Simpson Desert Regional Reserve is difficult to formulate and appears to have changed over the last ten years. Once dominant, organised tours are now in a minority, presumably because of increased availability of 4WD vehicles.

Tourism statistics from 1991 indicated that the majority of tourists to South Australian outback areas were couples in the age group of 25-39 years (33%) (Flinders Ranges and Outback Tourism, South Australia 1991). 1996 figures also found couples to be the dominant travelling group, however the most common age class was the over 50s (38%) (Flinders Ranges and Outback Tourism, South Australia 1996). Anecdotal evidence suggests that this trend is also representative of travellers to the Simpson Desert (Guan 1998; Rowlands 1998).

Most tour operators working in the Simpson Desert Regional Reserve make two to three trips per year, each trip being rarely more than seven days and taking between ten and 20 people. The French Line is the most frequently used track by most visitors, with the remaining tracks through the reserve being used to varying degrees. A few tour operators want to expand, but the majority do not expect the frequency of their activities to change in the near future.

In 1983 it was suggested that the most common motivation to visit the region was the quest for a remote area experience (South Australian Department of Environment and Planning 1983). Whilst the majority of travellers, regardless of age or group status, are still reported to visit the desert for an arid zone or nature-based experience, there is the added attraction of recreational driving.

4 IMPACT OF THE UTILISATION OF THE RESOURCES ON WILDLIFE AND NATURAL FEATURES

4.1 Petroleum Exploration

There has been no petroleum exploration or production in the Simpson Desert Regional Reserve since proclamation. The only activity in the region has been the construction of two exploratory wells, one in the Simpson Desert Conservation Park in 1989 (*Poolowanna 3*) and the other to the south of the Simpson Desert Regional Reserve in PEL 50 (*Lake Kool 1*). Hence, there has been no impact of the utilisation of the petroleum resources on the conservation of the wildlife and natural features.

4.2 Tourism and Recreation

Tourism and recreation activities in the Simpson Desert Regional Reserve have increased in the past ten years, and as a result, there has been an increase in the utilisation of the natural resources. Whilst most visitors prefer to camp at Purni Bore when on the western desert margins, there are no designated camping areas or facilities within the reserve and users generally camp in clearings adjacent to tracks. This limits the localised impact on habitats and vegetation associated with constant or frequent human use.

Visually, one of the principal impacts of tourism and recreation within the reserve is litter. It is primarily an aesthetic problem with minimal ecological consequences. There are no rubbish disposal facilities within the reserve, and visitors are requested to carry all rubbish within their vehicles and dispose of it appropriately after leaving the reserve. It is thought that most visitors abide by these rules (Friebe and Friebe 1998). The small number of complaints received by the relevant authorities regarding litter (Guan 1998; Rowlands 1998), supports this. Some travellers bury rubbish, however, local authorities discourage this because Dingoes dig it up and spread it (Rowlands 1998).

In addition to ongoing litter removal by National Parks and Wildlife staff, Friends of the Simpson Desert members and the general public, two major cleanups have been performed in the Simpson Desert. These took place in 1992 and 1998 and were coordinated by the Friends of the Simpson Desert. The more recent cleanup resulted in the removal of litter from all tracks within the regional reserve with the exception of the K1 line. Large inputs of litter may also occur during and shortly after major events within the region (eg Birdsville Races; Rowlands 1998).

Not only do desert species of trees and shrubs have low growth rates, but they continue to provide valuable fauna habitat after senescence. The collection of dead wood for use in campfires is allowed within the Simpson Desert Regional Reserve and, at present, the depletion of dead wood does not appear to be a significant issue. However, as visitor numbers increase within the reserve, the situation may change and require review.

An impact of motor vehicles is through the ongoing use of old seismic lines. Seismic lines are reportedly able to revegetate to within natural variability in approximately eight years if undisturbed (Cockshell 1998). Continual driving on these tracks reverses this regenerative process and Entrances to many old seismic lines within the Simpson Desert have been ripped to aid regeneration and to help conceal the track. It is believed that there is minimal use of old seismic survey tracks within the Simpson Desert Regional Reserve (Friebe and Friebe 1998). One track occasionally used is located 10-15 km south of Approdinna Attora Knolls and runs east towards *Glen Joyce* oil well (Friebe and Friebe 1998).

A clay-capped track exists, running south into the Kallakoopah area, and another less well-made track (unmarked on any maps) runs east-west between Cowarie and Macumba Stations. Suggestions have been made by a variety of stakeholders that increasing the accessibility of this southern portion of the Simpson Desert Regional Reserve would be an added tourist attraction. However, it would also compromise wilderness values and increase visitor pressure.

5 IMPACT OF THE UTILISATION OF THE RESOURCES ON CULTURAL FEATURES

5.1 ABORIGINAL CULTURAL FEATURES

5.1.1 Petroleum Exploration

There has been no petroleum exploration or production in the Simpson Desert Regional Reserve since proclamation. The only activity in the region has been the construction of two exploratory wells, one in the Simpson Desert Conservation Park in 1989 and the other to the south of the Simpson Desert Regional Reserve in PEL 50. Hence, there has been no impact of the utilisation of the petroleum resources on the Aboriginal cultural features.

5.1.2 Tourism and Recreation

Current management of Aboriginal cultural features is based on non-intervention and discouragement of visitation of significant sites. Sites are not identified or marked in any way, and there have been no recorded impacts of tourism and recreation activities on the Aboriginal cultural features within the Regional Reserve since proclamation.

5.2 NON-INDIGENOUS CULTURAL FEATURES

5.2.1 Petroleum Exploration

There has been no petroleum exploration or production in the Simpson Desert Regional Reserve since proclamation. The only activity in the region has been the construction of two exploratory wells, one in the Simpson Desert Conservation Park in 1989 and the other to the south of the Simpson Desert Regional Reserve in PEL 50. Hence, there has been no impact of the utilisation of the petroleum resources on the non-Aboriginal cultural features.

5.2.2 Tourism and Recreation

Features such as the vehicular tracks themselves, particularly the French Line, are features of non-indigenous heritage significance. The traffic of motor vehicles regularly disturbs track surfaces, however, some tracks recover when ruts and bumps are filled in with drift sand (Butler 1998). As a result of the cessation of exploration and track maintenance by petroleum interests in the late 1980s, the condition of the Rig Road has been gradually deteriorating. Wind blown sand over the Rig Road is changing its character and it is no longer an easy route to travel. In addition, the clay capping on the Rig Road, laid down to enable movement of seismic vehicles, has been damaged, slowing the traffic on this track. In some sections, gullies have formed, channeling water and enhancing erosion. The failure of some drivers to deflate their tyres appropriately results in the scalloping of sandy tracks such as the French and WAA Lines.

6 IMPACT OR POTENTIAL IMPACTS OF RESOURCE UTILISATION ON THE ECONOMY OF THE STATE

A comprehensive economic analysis was prepared for this review and is presented in Econsearch (1998) and reproduced in full in Appendix M. The following summary information has been drawn from this report.

Currently, it is only tourism, management and research activities that are generating quantifiable economic impacts. These estimated impacts are summarised in Table 1. Impacts at the local level and the rest of the state are specified for four economic indicators:

- business turnover
- value added (gross state product)
- employment, and
- household income.

In terms of tourism and recreation, business turnover is equivalent to the total income to tourist businesses, value added is the expenditure by visitors, employment is the jobs created, and household income is the salary or wages for the jobs created.

Table 1 Estimated Economic Impact of Activities Utilising the Resources of the Simpson Desert Regional Reserve (direct plus indirect effects)(1997-98).

	Business Turnover ($'000)	Value Added ($'000)	Employment (jobs)	Household Income ($'000)
Simpson Desert region	840	310	9	165
Elsewhere in SA	1430	670	12	335
Total SA	**2270**	**980**	**21**	**500**

Given that the annual gross state product is currently more than $35 billion, the Simpson Desert contributes approximately 0.003% to this. Although the impacts are not large in absolute terms, it is worth noting that in the Simpson Desert region (the Collector Districts of Oodnadatta and Simpson Desert) the employment generated (nine jobs) comprises almost five per cent of total regional employment.

The economic value of the Simpson Desert Regional Reserve, is greater than that implied by demand for tourism in the area and expenditures on management and research. In a market economy, issues of valuation and choice between conflicting uses are normally resolved by the interaction of consumers and producers trading goods in the market place. However, determining comparable values of non-market uses, such as conservation (including the value of the harmful consequences on these uses from conflicting activities) is more difficult and thus, they have no easily calculable price (Econsearch 1998).

7 CONCLUSIONS AND DISCUSSION

A variety of options exist for the future status of the Simpson Desert Regional Reserve area:

- leave National Parks and Wildlife reserve status of current area as Regional Reserve
- proclaim a different area as Regional Reserve
- change National Parks and Wildlife reserve status of total area to Conservation Park, and
- change the status of the current area of the Simpson Desert Regional Reserve to Unalloted Crown Land.

Leave National Parks and Wildlife reserve status of current area as Regional Reserve

Much of the active management in the Simpson Desert Regional Reserve has occurred because of its location between or around Witjira National Park and the Simpson Desert Conservation Park. The conservation and management efforts of National Parks and Wildlife and volunteer groups, such as the Friends of the Simpson Desert, are mainly directed at visitor attractions which occur in Witjira National Park or the Simpson Desert Conservation Park. There are no sites of particular visitor interest within the Simpson Desert Regional Reserve and therefore less management presence is required.

The Friends of the Simpson Desert cleanups in 1992 and 1998 are likely to have included the area of the Simpson Desert Regional Reserve regardless of its reserve status. This is because the voluntary organisations involved are motivated more by goodwill than by geographic boundaries (Friebe and Friebe 1998). Government agencies such as National Parks and Wildlife are, however, restricted to activities which clearly fall within their jurisdiction, and do not have the discretionary ability (or the resources) to work outside their defined area. The track marking and interpretative signage installed by National Parks and Wildlife, with significant assistance from Friends of the Simpson Desert, may not have been undertaken, had the area not been a constituted National Parks and Wildlife reserve.

Pressure from competing land uses (ie other than conservation) such as mining, petroleum exploration or extraction, and pastoralism, have been and currently are, either minimal or non-existent. Tourism and recreation are really the only significant other land uses which currently place any pressure on the need for a 'multiple use' regime to be in place.

Proclaim a different area as Regional Reserve

The research undertaken for this report has not uncovered any 'new' natural features in areas outside and adjacent to the current reserve boundaries which are likely to be enhanced or maintained in a better condition should they come under National Parks and Wildlife management and control. By the same token, the current Regional Reserve area, whilst having high intrinsic value in its own right, does provide an environmental buffer to the Simpson Desert Conservation Park and Witjira National Park. The Regional Reserve does not have any major features close to the existing boundaries and, the precise location of the boundaries are not, therefore, critical in terms of conservation of specific features, but are strategic. The current size and shape of the Simpson Desert Regional Reserve provides the value of a large buffer area around features of high conservation value, and is also a large contiguous area with a low edge to area ratio (ie minimal edge effects from adjacent areas).

Change National Parks and Wildlife reserve status of total area to Conservation Park

Another alternative is to upgrade the National Parks and Wildlife status of the area to that of Conservation Park. With changes in technology, infrastructure needs, or pricing arrangements for petroleum-based products, it is possible that the oil and gas reserves under the Simpson Desert Regional Reserve may become commercially viable to exploit. The economic multiplier effects and flow-ons which would occur, should this happen, are likely to make some form of joint proclamation which allows for further petroleum industry activities the probable outcome. It would be economically short-sighted to preclude this possibility. The implications for management of the reserve would be very similar to the situation which currently exists under the regime of a Regional Reserve.

Whether more or less protection of natural and cultural features is offered within the National Parks and Wildlife category of Regional Reserve or Conservation Park (under a joint proclamation agreement) is debatable. Conversion to the latter management regime would entail some new

administrative arrangements to be negotiated for the elevated conservation status. There is a **perceived** difference by both the mining and environmental groups between these administrative arrangements, however, there is very little **real** difference, both in terms of management priorities and protection from degradation by mining activities.

Whether this area is a Regional Reserve or a jointly-proclaimed Conservation Park, the workability of the multiple-use concept is totally dependent on a management plan which clearly defines the limits of sustainability and provides adequate protection for the natural and historical features.

Change the status of the current area of the Simpson Desert Regional Reserve to Unalloted Crown Land

Minimal as it may appear to be, the protection of natural and cultural features afforded by either a joint proclamation as a Conservation Park or a Regional Reserve is far more than any which would exist if the area became Unalloted Crown Land.

As Unalloted Crown Land, exploration activities would not have the same level of conservation outcome integrated with their objectives, and with no regional personnel to administer the area, tourist activities would become uncontrolled. The budget of National Parks and Wildlife currently allocated to management activities such as track marking and maintenance, and other conservation-orientated projects would not be available and the potential for degradation would be increased.

7.1 Nature Conservation Management

Evidence suggests that the current management regime is not having a significant effect on the wildlife and natural and cultural features of the reserve area. Due to a lack of data, or a lack of appropriate indicators, it could be assumed that there may be impacts of which we are unaware. Certainly, more management effort directed toward the control of feral camels, an ongoing vigilance with respect to the potential re-emergence of the European Rabbit as a significant ecological alteration agent, and the control and direction of visitors to minimise their negative effects is likely to be beneficial to the natural and cultural features of the reserve. Currently no significant causes for concern exist.

7.2 Aboriginal Cultural Heritage

Current management is based on non-intervention and discouragement of visitation of significant sites. There are no recorded impacts, human or other, on the Aboriginal cultural features in the Regional Reserve. Future management of significant sites will be negotiated with the traditional owners.

7.3 Non-Indigenous Cultural Heritage

Features such as the vehicular tracks themselves, particularly the French Line, are features of non-Aboriginal heritage significance. No significant management effort has been expended on their maintenance since proclamation, aside from some minor works to repair flood damaged areas. Though the condition of many of these tracks has deteriorated, opinions vary as to whether this deterioration is positive or negative, in terms of the overall impact of tourism and recreation.

7.4 Petroleum Exploration

In the period since proclamation, no petroleum exploration of any significance has occurred. Disused seismic lines have recovered to varying degrees and the current expectations of any future activities are low.

Some consideration has been given to extending an existing pipeline between Darwin and Alice Springs further south to Moomba. Should this possible scenario eventuate, the Alice Springs to Moomba section could traverse the Simpson Desert Regional Reserve (Langley 1998). What effect this pipeline would have (if it is ever built), both on the environment, and on the viability of exploiting some of the known reserves of oil and gas under the Simpson Desert Regional Reserve is unknown. It is highly speculative at this stage, and whatever status of National Parks and Wildlife reserve the area has, any activities of this kind would need to be closely controlled and monitored.

7.5 Tourism and Recreation

In a climate over the ten years since proclamation of steadily increasing tourism activity, accompanied by a net regeneration of much of the area covered by the Regional Reserve, it appears that even increasing visitation is not having significant impacts, positive or negative, on the natural features of the Simpson Desert Regional Reserve. There are differing opinions as to whether tracks becoming more difficult to traverse is a positive or negative effect. From a wildlife and natural conservation perspective, it can be positive in terms of deterring visitors, and hence lessening their impact, and slowing them down also becomes safer. But the constant deterioration of the tracks can hinder or slow emergency rescue efforts, cause the creation of detour tracks, and the gradual destruction of the original tracks themselves is seen by some to be degradation of a significant piece of non-Aboriginal history.

8 RECOMMENDATIONS

Based on the available information, the impacts, positive or negative, on wildlife and natural and historical features of the reserve appear to have been insignificant in the period since proclamation. In economic terms, the net value to the State of the Simpson Desert Regional Reserve being managed and administered as it has since 1988 is estimated to be approximately $980 000 per annum.

The recommendations are that:

- The Simpson Desert Regional Reserve remain in the National Parks and Wildlife reserve category of Regional Reserve.
- A plan for the management of the area be formulated, which includes clear objectives and clearly defined environmental and economic indicators which enable adequate data collection for future assessments of management performance.

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APPENDICES

Appendix A
List of Stakeholders Contacted Directly for this Review

Stakeholders not already mentioned in the Acknowledgments who were directly approached for opinions and other information regarding the Regional Reserve and its use over the period since proclamation.

Individuals and non-Government environmental organisations

Dr Tim Fatchen
Friends of the French Line
Friends of the Simpson Desert
Nature Conservation Society of SA
S A Association of 4WD Clubs
S A Conservation Council
Wilderness Society

Individuals and organisations in the region

Phil Hellyer, Mount Dare Station
Adam Plate, Pink Roadhouse Oodnadatta
Queensland Police, Birdsville Police Station
Diamantina Shire Council

Pastoral properties adjoining or with a potential influence on the region

Cowarie Station
Goyders Lagoon Station
Kallakoopa West Station
Mount Sarah / Eringa Station
New Crown Station
Pandie Pandie Station
S Kidman & Co (Macumba Station)

Individuals or organisations with knowledge or information pertaining to Aboriginal cultural heritage

Linda Crombie, Birdsville
Central Lands Council
Don Rowlands, Queensland National Parks & Wildlife Service
Luise Hercus, Australian National University, Canberra
Irrwanyere Aboriginal Corporation
Witjira National Park Management Committee
Annie Nicolson, Culture and Heritage
Jim McHugh, Native Title Claims, DEHAA
Geoff Ah Chee, Ranger, Witjira National Park

Tourism Operators known to use the area

AAT Kings Tours

Alltrac Services
Alps Action Adventure
Australia wide Driver Education
Ballarat Off-Road
Bendigo Off-Road
Buffalo Tours Pty Ltd
Bus and Coach Association
Bush Safari Co.
Butlers Outback Safaris
C to C Tours
Caudell's Explorers
Centrek Safaris
Channel Country Safaris
Craig and Kay's Australia
Daryl Edwards 4WD & Marine
Eco Tagalong Tours
Festival Tours
Flinders Ranges & Outback Tourism
Four Wheel Drive Systems
Getabout 4WD Adventures
Gill's 4WD Centre
Great Divide Tours
Motorcycle Safaris Australia
Outback Bush Adventures S A
Oz Auto 4WD Centre
Portmans Australian Adventures
S A 4WD Club
Safari 4X4 Centre
Storey's Coach Services
Take a Tour by Jingo
The Desert Wanderer
Wedgetail Tours

Appendix B Plant Species Recorded from the Simpson Desert Regional Reserve (including the Simpson Desert C P)

Within family, species are arranged in alphabetic order. Plant taxonomy follows Jessop (1993) and common names from the S A Flora database (administered by Planning SA).
Conservation status codes are shown in bold following the scientific name. The first code is the Australian status according to the *Commonwealth Endangered Species Protection Act 1992* (based on the ANZECC list of Threatened Species, August 1998); the second is the State status according to the South Australian *National Parks and Wildlife Act 1972* schedule. Status codes are defined in greater detail in Briggs and Leigh (1995) and Lang and Kraehenbuehl (1994).

- **V Vulnerable - rare and at risk from potential threats or long term threats which could cause the species to become endangered in the future.**
- **R Rare - having a low overall frequency of occurrence: confined to a restricted range or scattered sparsely over a wider area. Not currently exposed to significant threats but warranting monitoring and protective measures to prevent reduction of populations.**

The columns indicate the source of plant species records as follows:
1. South Australian Environmental Database, 27 August 1998 (administered by Planning SA).
2. Records from the South Australian State Herbarium, 10 September 1998.
3. Listed in the Simpson Desert Conservation Park Draft Management Plan, 1983.
Note: The Herbarium records are not to be taken as a list of all species in the region as represented in the State Herbarium. Data entry is incomplete and the coverage in the specimen database is variable, some groups like the *Acacia* being comprehensive, whilst others like the *Goodeniaceae* have very few records.

*** Introduced species**

Family	Scientific Name	Common Name	Source		
MARSILEACEAE					
	Marsilea drummondii	common nardoo	1		
	Marsilea sp.				3
PROTEACEAE					
	Grevillea juncifolia	honeysuckle spider-flower	1		3
	Grevillea stenobotrya	sandhill spider-flower	1		3
	Grevillea striata	beefwood			3
	Hakea divaricata	corkbark			3
	Hakea eyreana	corkbark	1		3
	Hakea leucoptera	needle bush	1		3
SANTALACEAE					
	Santalum lanceolatum	plumbush	1		3
LORANTHACEAE					
	Amyema maidenii ssp. *maidenii*	pale-leaf mistletoe	1		
	Amyema preissii	wire-leaf mistletoe	1		3
	Diplatia grandibractea	coolibah mistletoe		2	
	Lysiana subfalcata		1		
POLYGONACEAE					
	Muehlenbeckia florulenta	lignum	1		
GYROSTEMONACEAE					
	Gyrostemon ramulosus	camel poison bush			3
NYCTAGINACEAE					
	Boerhavia dominii	tar-vine	1		
	Boerhavia schomburgkiana	Schomburgk's tar-vine	1		
	Boerhavia sp.		1		3

Family	Scientific Name	Common Name	Source		
AIZOACEAE					
	Glinus lotoides	hairy carpet-weed		2	
	Gunniopsis quadrifida	Sturt's pigface	1		
	Trianthema pilosa		1	2	3
	Trianthema triquetra	red spinach	1		
	Zaleya galericulata	hogweed	1		
PORTULACACEAE					
	Calandrinia balonensis	broad-leaved parakeelya			3
	Calandrinia disperma		1		
	Calandrinia polyandra	parakeelya	1		3
	Calandrinia remota	round-leaved parakeelya			3
	Calandrinia sp		1		
PORTULACACEAE	*Portulaca intraterranea*	large pigweed	1		3
	Portulaca oleracea	common pigweed	1		
CARYOPHYLLACEAE					
	Mollugo cerviana	wire-stem chickweed	1		
	* *Spergularia marina*	salt sand-spurrey		2	
CHENOPODACEAE					
	Atriplex acutibractea ssp. *acutibractea*	pointed saltbush	1		
	Atriplex angulata	fan saltbush	1	2	3
	Atriplex crassipes			2	
	Atriplex eardleyae	small saltbush	1		
	Atriplex fissivalvis	gibber saltbush		2	
	Atriplex holocarpa	pop saltbush	1	2	
	Atriplex intermedia			2	
	Atriplex leptocarpa	slender-fruited saltbush		2	
	Atriplex limbata	spreading saltbush	1	2	3
	Atriplex lindleyi ssp.	baldoo	1	2	
	Atriplex lobativalvis			2	
	Atriplex nummularia ssp.			2	
	Atriplex nummularia ssp. *nummularia*	old-man saltbush	1		3
	Atriplex nummularia ssp. *omissa*	Oodnadatta saltbush	1		3
	Atriplex pseudocampanulata	mealy saltbush		2	
	Atriplex spongiosa	pop saltbush	1	2	3
	Atriplex velutinella	sandhill saltbush	1	2	3
	Atriplex vesicaria ssp.	bladder saltbush	1	2	3
	Atriplex vesicaria ssp. *calcicola*	bladder saltbush	1		3
	Atriplex vesicaria ssp. *variabilis*	bladder saltbush	1		3
	Chenopodium auricomum	golden goosefoot	1	2	3
	Chenopodium cristatum	crested goosefoot		2	
	Chenopodium truncatum		1	2	
	Dissocarpus paradoxus	ball bindyi	1	2	3
	Dysphania glomulifera ssp. *eremaea*	globular pigweed		2	
	Dysphania plantaginella	plantain crumbweed	1		
	Dysphania platycarpa	flat-fruit crumbweed		2	
	Dysphania simulans	erect crumbweed			3
	Einadia nutans ssp.	climbing saltbush		2	
	Enchylaena tomentosa var. *glabra*	ruby saltbush	1	2	3
	Enchylaena tomentosa var. *tomentosa*	ruby saltbush	1	2	3
	Eremophea spinosa		1		3
	Halosarcia halocnemoides	grey samphire	1	2	3
	Halosarcia halocnemoides ssp. *halocnemoides*	grey glasswort	1		3
	Halosarcia halocnemoides ssp. *longispicata*	grey glasswort	1		3
	Halosarcia halocnemoides ssp. *tenuis*	grey samphire	1		3
	Halosarcia indica ssp. *bidens*	brown-head samphire			3
	Halosarcia indica ssp. *leiostachya*	brown-head samphire		2	3

Family	Scientific Name	Common Name	Source		
	Halosarcia pergranulata ssp. *pergranulata*	black-seed samphire		2	
	Halosarcia pluriflora		1		
	Halosarcia pruinosa		1		
	Malacocera drummondii		1		
	Maireana aphylla	cotton-bush	1	2	3
	Maireana appressa	grey bluebush	1	2	3
	Maireana astrotricha	grey bluebush	1	2	
	Maireana ciliata	hairy bluebush		2	
	Maireana coronata	crown fissure-weed	1	2	
	Maireana georgei	slit-wing bluebush		2	
	Maireana integra	entire-wing bluebush		2	
	Maireana lanosa				3
	Maireana melanocarpa **V,V**	black-fruited bluebush			
	Maireana microcarpa	swamp bluebush		2	
	Maireana pyramidata	black bluebush	1	2	3
	Maireana turbinata	top-fruit bluebush		2	
	Malacocera albolanata	woolly soft-horns		2	
	Osteocarpum acropterum var. *acropterum*	water weed	1	2	3
	Osteocarpum acropterum var. *diminutum* **-,R**	wingless bonefruit	1		3
	Osteocarpum dipterocarpum	two-wing bonefruit		2	3
	Osteocarpum sp		1		
CHENOPODACEAE					
	Rhagodia eremaea	tall saltbush	1		
	Rhagodia spinescens	spiny saltbush	1	2	3
	Salsola kali	roly-poly	1	2	3
	Sclerolaena bicornis var. *bicornis*	goathead burr		2	3
	Sclerolaena birchii	galvanised burr			3
	Sclerolaena brachyptera	short-wing bindyi		2	
	Sclerolaena calcarata	redburr	1	2	
	Sclerolaena convexula	tall bindyi			3
	Sclerolaena cuneata	poverty-bush		2	
	Sclerolaena decurrens	green copperburr	1	2	
	Sclerolaena diacantha	grey bindyi	1	2	3
	Sclerolaena divaricata	poverty-bush		2	3
	Sclerolaena eriacantha	silky copperburr		2	
	Sclerolaena fontinalis		1		
	Sclerolaena holtiana **-,R**		1	2	
	Sclerolaena intricata	tangled poverty-bush	1	2	3
	Sclerolaena johnsonii	Johnson's copperburr			3
	Sclerolaena lanicuspis	woolly bindyi	1	2	3
	Sclerolaena muricata var. *muricata*	five-spined bassia			3
	Sclerolaena muricata var. *semiglabra*	five-spined bassia			3
	Sclerolaena parallelicuspis	western copperburr		2	
	Sclerolaena patenticuspis	spear-fruit bindyi	1		
	Sclerolaena uniflora	small-spine bindyi	1	2	
	Sclerostegia disarticulata	samphire			3
	Sclerostegia medullosa	glasswort			3
	Sclerostegia tenuis	slender glasswort	1	2	3
AMARANTHACEAE					
	Alternanthera denticulata	lesser joyweed	1		
	Amaranthus grandiflorus	large-flower amaranth			3
	Amaranthus mitchellii	boggabri weed	1	2	
	Ptilotus aristatus var. *aristatus*	crimson fox tail		2	
	Ptilotus latifolius var. *latifolius*	tangled mulla mulla	1	2	3
	Ptilotus nobilis var. *nobilis*	regal fox-tail	1		

Family	Scientific Name	Common Name	Source		
	Ptilotus obovatus var. *griseus*	silver mulla mulla			3
	Ptilotus obovatus var. *obovatus*	mulla mulla			3
	Ptilotus polystachyus var. *polystachyus*	long-tails	1		3
	Ptilotus sessilifolius	silver tails	1		3
CRUCIFERAE					
	Arabidella eremigena	priddiwalkatji			3
	Blennodia canescens	native stock	1		3
	Blennodia pterosperma	wild stock	1		3
	Harmsiodoxa blennodioides	hairypod cress			3
	Lepidium papillosum	warty peppercress		2	
	Lepidium rotundum	veined peppercress			3
	Stenopetalum lineare	narrow thread-petal			3
CRASSULACEAE					
	Crassula colorata var. *acuminata*	dense stonecrop		2	
LEGUMINOSAE					
	Acacia aneura var. *aneura*	mulga	1	2	3
	Acacia aneura var. *conifera*	mulga	1		3
	Acacia cambagei	gidgea		2	3
	Acacia cibaria	umbrella mulga		2	3
	Acacia dictyophleba	waxy wattle	1	2	3
	Acacia georginae **-,R**	Georgina gidgea	1	2	
	Acacia jennerae **-,R**	Coonavittra wattle		2	
	Acacia ligulata	umbrella bush	1	2	3
	Acacia maitlandii	spiky wattle			3
	Acacia murrayana	sandplain wattle	1	2	3
	Acacia oswaldii	umbrella wattle	1	2	3
	Acacia pickardii **V,V**			2	
	Acacia ramulosa	horse mulga	1	2	3
	Acacia salicina	Broughton willow		2	
	Acacia stenophylla	river coobah		2	
	Acacia tetragonophylla	dead finish	1	2	3
	Acacia victoriae ssp. *pruinose*			2	
LEGUMINOSAE					
	Acacia victoriae ssp. *arida*	elegant wattle	1	2	3
	Acacia victoriae ssp. *victoriae*	elegant wattle	1	2	3
	Crotalaria cunninghamii	birdflower	1		3
	Crotalaria eremaea ssp. *eremaea*	bluebush pea	1		3
	Crotalaria eremaea ssp. *strehlowii*	bluebush pea	1		3
	Crotalaria novae-hollandiae ssp. *lasiophylla*		1		3
	Crotalaria smithiana	yellow rattlepod	1		3
	Cullen australsicum		1		
	Cullen discolor		1		
	Cullen pallidum		1		
	Indigofera colutea	sticky indigo			3
	Indigofera helmsii				3
	Isotropis wheeleri	Wheeler's lamb-poison			3
	Lotus cruentus	red-flower lotus	1		3
	Lysiphyllum gilvum	bauhinia			3
	Psoralea australasica	tall scurf-pea			3
	Psoralea patens	native verbine			3
	Senna artemisioides		1		
	Senna artemisioides nothossp. *coriacea*	broad-leaf desert senna	1		3
	Senna artemisioides ssp. *petiolaris*	flat-stalk senna		2	
	Senna artemisioides ssp. *quadrifolia*	four-leaf desert senna			3
	Senna pleurocarpa var. *pleurocarpa*	firebush	1		3

Family	Scientific Name	Common Name	Source		
	Swainsona affinis	small-leaved swainsona pea	1	2	
	Swainsona flavicarinata	yellow-keel swainson-pea	1	2	
	Swainsona laxa		1		
	Swainsona microphylla ssp. *pallescens*	yellow poison-pea			3
	Swainsona phacoides ssp. *phacoides*	dwarf swainsona	1		3
	Swainsona procumbens **-,R**	Broughton pea			3
	Swainsona rigida				3
	Swainsona tephrotricha **-,R**	ashy-haired swainsona	1		
	Swainsona sp.		1		
	Tephrosia brachyodon				3
	Tephrosia sphaerospora	mulga trefoil	1		3
	Trigonella suavissima	channel clover	1		
GERANIACEAE					
	Erodium cygnorum ssp. *glandulosum*	clammy heron's-bill	1		3
ZYGOPHYLLACEAE					
	Nitraria billardierei	nitrebush	1	2	3
	Tribulus eichlerianus		1	2	
	Tribulus hystrix	caltrop	1	2	3
	* *Tribulus terrestris*	caltrop	1		
	Zygophyllum ammophilum	sand twinleaf			3
	Zygophyllum crassissimum **-,R**			2	
	Zygophyllum emarginatum			2	
	Zygophyllum howittii	clasping twinleaf	1	2	3
	Zygophyllum humillimum **-,R**	small-fruit twinleaf		2	
	Zygophyllum iodocarpum	violet twinleaf		2	
	Zygophyllum prismatothecum	square-fruit twinleaf		2	
	Zygophyllum simile			2	
EUPHORBIACEAE					3
	Adriana hookeri **-,R**	mallee bitterbush			3
	Euphorbia drummondii	caustic weed	1		3
	Euphorbia tannensis ssp. *eremophila*	bottle tree caustic	1		3
	Euphorbia wheeleri	Wheeler's spurge			3
	Phyllanthus fuernrohrii	sand spurge	1		3
	Phyllanthus lacunarius	lagoon spurge	1		3
	Sauropus ramosissimus		1		
	Sauropus trachyspermus	slender spurge	1		3
	Dodonaea viscosa ssp. *angustissima*	narrow-leaf hop-bush	1		3
	Dodonaea viscosa ssp. *mucronata*	sticky hop-bush	1		3
	Dodonaea viscosa ssp. *spatulata*	sticky hop-bush	1		3
MALVACEAE					
	Abutilon fraseri ssp. *diplotrichum*			2	
	Abutilon halophilum			2	
	Abutilon malvaefolium	scrambling lantern-bush	1		
MALVACEAE	*Abutilon otocarpum*	desert Chinese-lantern	1	2	3
	Hibiscus krichauffianus	velvet-leaf hibiscus	1	2	3
	Lavatera plebeia	native hollyhock			3
	Lawrencia squamata	thorny lawrencia	1		
	Sida ammophila	sand sida	1	2	
	Sida corrugata var.	corrugated sida			3
	Sida cunninghamii	ridge sida	1		3
	Sida fibulifera	silver sida	1		3
	Sida rohlenae **-,R**	shrub sida			
	Sida trichopoda	narrow-leaf sida	1		

Family	Scientific Name	Common Name	Source		
THYMELAEACEAE					
	Pimelea penicillaris **-,R**	sandhill riceflower	1	2	3
	Pimelea simplex ssp. *continua*	desert riceflower		2	
	Pimelea trichostachya	spiked riceflower			3
FRANKENIACEAE					
	Frankenia foliosa	leafy sea-heath	1		3
	Frankenia serpyllifolia	bristly sea-heath	1	2	3
CUCURBITACEAE					
	* *Citrullus colocynthis*	paddy melon	1		3
	* *Citrullus lanatus* var. *lanatus*	bitter melon	1		
	Mukia maderaspatana	snake vine	1		3
	Mukia micrantha	desert cucumber	1		
MYRTACEAE					
	Eucalyptus centralis	bloodwood			3
	Eucalyptus coolabah ssp. *arida*	coolibah	1		3
	Thryptomene maisonneuvei	desert heath myrtle			3
HALORAGACEAE					
	Haloragis aspera		1		3
	Haloragis gossei				3
UMBELLIFERAE					
	Daucus glochidiatus	native carrot	1		
	Trachymene glaucifolia	wild parsnip	1		3
	Trachymene pilosa		1		
GENTIANACEAE					
	* *Centaurium spicatum*	spike centaury			3
ASCLEPIADACEAE					
	Cynanchum floribundum	desert cynanchum	1		
RUBIACEAE					
	Dentella pulvinata		1		
	Pomax umbellata	pomax			3
	Synaptantha tillaeacea				3
CONVOLVULACEAE					
	Convolvulus erubescens	Australian bindweed	1		3
	Evolvulus alsinoides	tropical speedwell	1		3
	Ipomoea muelleri	poison morning glory			3
	Ipomoea polymorpha	silky cow-vine	1		3
BORAGINACEAE					
	Halgania cyanea	rough halgania	1		
	Heliotropium pleiopterum				3
	Trichodesma zeylanicum	camel bush	1		3
VERBENACEAE					
	* *Verbena officinalis*	common verbena		2	
CHOLANTHACEAE					3
	Dicrastylis costelloi		1		3
	Dicrastylis costelloi var. *violacea*			2	
	Newcastelia spodiotricha		1		3
LABIATAE					
	Teucrium albicaule	scurfy germander	1		
SOLANACEAE					
	Nicotiana occidentalis			2	
	Nicotiana velutina	velvet tobacco	1	2	3
	Solanum centrale	desert raisin		2	3
	Solanum chenopodinum	goosefoot potato-bush			3
	Solanum coactiliferum	tomato-bush			3
	Solanum ellipticum	potato-bush	1	2	3

Family	Scientific Name	Common Name	Source		
SOLANACEAE	*Solanum esuriale*	quena	1	2	3
	Solanum oligacanthum	desert nightshade	1		
SCROPHULARIACEAE					
	Mimulus gracilis	slender monkey-flower		2	
	Peplidium foecundum	dwarf peplidium		2	
	Stemodia florulenta	bluerod	1	2	3
	Stemodia glabella	smooth blue rod			3
PEDALIACEAE					
	Josephinia eugeniae	Josephinia burr	1		
MYOPORACEAE					
	Eremophila latrobei ssp. *glabra*	crimson turkey-bush			3
	Eremophila longifolia	weeping emubush	1		3
	Eremophila macdonnellii	MacDonnell's desert fuschia	1		3
	Eremophila maculata var. *maculata*	spotted emubush	1		
	Eremophila obovata var. *obovata*				3
	Eremophila willsii	sandhill native fuchsia	1		3
PLANTAGINACEAE					
	Plantago drummondii	sago weed			3
	Plantago varia				3
CAMPANULACEAE					
	Lobelia heterophylla Labill. **-,R**				3
GOODENIACEAE					
	Goodenia berardiana	twin-head goodenia			3
	Goodenia cycloptera	serrated goodenia	1		3
	Goodenia fascicularis	silky goodenia			3
	Goodenia glabra	shining pansy			3
	Goodenia heterochila	serrated goodenia			3
	Goodenia lunata		1		3
	Lechenaultia divaricata	tangled leschenaultia	1	2	3
	Scaevola bicornis		1		
	Scaevola collaris		1		3
	Scaevola depauperata	skeleton fanflower	1		3
	Scaevola humilis	inland fanflower			3
	Scaevola parvibarbata	small-beard fanflower	1	2	3
	Scaevola spinescens	spiny fanflower			3
	Velleia connata				3
COMPOSITAE					
	Anemocarpa podolepidium	rock everlasting		2	
	Angianthus brachypappus	spreading cup-flower		2	
	Brachycome ciliaris var. *ciliaris*	variable daisy			3
	Brachycome ciliaris var. *lanuginosa*	woolly variable daisy			3
	Brachycome ciliaris var. *lyrifolia*	variable daisy			3
	Brachycome dichromosomatica var. *dichromosomatica*		2		
	Brachycome iberidifolia	Swan River daisy			3
	Calocephalus platycephalus	billybuttons		2	
	Calotis erinacea	tangled burr-daisy	1		3
	Calotis hispidula	bogan flea	1	2	3
	Calotis latiuscula	leafy burr-daisy			3
	Calotis multicaulis	woolly-headed burr-daisy			3
	Centipeda thespidioides	desert sneezeweed	1		
	Chrysocephalum eremaeum		1		3
	Chrysocephalum pterochaetum	shrub everlasting			3
	Chrysocephalum semicalvum ssp. *semicalvum*	hill everlasting			3
	Craspedia chrysantha	golden billy-buttons			3
	Craspedia pleiocephala	soft billy-buttons		2	
	Epaltes australis	spreading nut-heads		2	

Family	Scientific Name	Common Name	Source		
	Epaltes cunninghamii	tall nut-heads	1	2	
	* *Gnaphalium polycaulon*	western cudweed		2	
	Gnephosis arachnoidea	spidery button-flower	1		
	Gnephosis eriocarpa	native camomile			3
	Gnephosis tenuissima	dwarf cup-flower			3
	Ixiochlamys nana	small fuzzweed			3
	Ixiolaena brevicompta	plains plover-daisy		2	
	Ixiolaena chloroleuca	pale plover-daisy	1	2	
	Ixiolaena leptolepis	stalked plover-daisy	1	2	
	Lawrencella davenportii	sticky everlasting			3
COMPOSITAE					
	Minuria cunninghamii	bush minuria	1		
	Minuria denticulata	woolly minuria	1		3
	Minuria integerrima	smooth minuria	1		
	Myriocephalus rudallii			2	
	Othonna gregorii	fleshy groundsel	1		3
	Podolepis canescens	large copper-wire daisy			3
	Polycalymma stuartii	poached-egg daisy	1		3
	Rhodanthe citrina	pale immortelle			3
	Rhodanthe floribunda	white everlasting	1		3
	Rhodanthe moschata	musk sunray			3
	Rhodanthe stricta	slender sunray		2	
	Rhodanthe tietkensii	sand sunray	1		3
	Rhodanthe uniflora	woolly sunray		2	
	Rutidosis helichrysoides	grey wrinklewort	1		
	Senecio cunninghamii var. *serratus*	shrubby groudsel	1	2	
	Senecio lautus	variable groundsel			3
	Streptoglossa adscendens	desert daisy	1		
	Trichanthodium skirrophorum	woolly yellow-heads			3
	Vittadinia eremaea	desert New Holland daisy	1		
LILIACEAE					
	Bulbine semibarbata	annual leek-lily			3
	Caesia lateriflora	native leek			3
	Wurmbea dioica ssp. *dioica*	early nancy			3
GRAMINEAE					
	Aristida contorta	mulga grass	1		3
	Aristida holathera var. *holathera*	tall kerosene grass	1		3
	Astrebla pectinata	barley Mitchell-grass	1	2	
	Bothriochloa ewartiana	desert blue-grass		2	
	Brachychiara gilesii			2	
	Brachychiara piligera			2	
	Brachychiara praetervisa			2	
	* *Cenchrus ciliaris*	buffel grass	1		
	Chloris pectinata	comb windmill grass		2	
	Chrysopogon fallax	golden-bearded grass		2	
	Dactyloctenium radulans	button-grass	1	2	3
	Dichanthium sericeum ssp. *humilius*	dwarf blue-grass	1		3
	Dichanthium sericeum ssp. *sericeum*	silky blue-grass	1		3
	Digitaria coenicola	spider grass		2	
	Diplachne fusca	brown beetle-grass	1	2	
	Echinochloa inundata **-,R**	channel millet		2	
	Elytrophorus spicatus	spike grass	1		
	Enneapogon avenaceus	common bottle-washers	1	2	3
	Enneapogon cylindricus	jointed bottle-washers	1	2	3
	Enneapogon polyphyllus	limestone bottle-washers	1	2	3
	Eragrostis australasica	cane-grass		2	

Family	Scientific Name	Common Name	Source		
	Eragrostis basedowii	neat lovegrass		2	
	Eragrostis dielsii var. *dielsii*	mulka grass	1	2	3
	Eragrostis eriopoda	woollybutt	1	2	3
	Eragrostis falcata	sickle love-grass		2	
	Eragrostis laniflora	hairy-flower woollybutt		2	3
	Eragrostis leptocarpa	slender love-grass	1	2	
	Eragrostis parviflora	weeping love-grass		2	
	* *Eragrostis pergracilis*	small love-grass	1		
	Eragrostis setifolia	narrow-leaf neverfail	1	2	3
	Eragrostis speciosa	handsome lovegrass		2	
	Eragrostis xerophila	knotty-butt neverfail		2	3
	Eriachne aristidea	three-awned wanderrie	1	2	3
	Eriachne mucronata	mountain wanderrie grass		2	
	Eriachne ovata	swamp wanderrie		2	
	Eriochloa australiensis	Australian cupgrass		2	
	Eriochloa pseudoacrotricha	perennial cupgrass		2	
	Eulalia aurea	silky browntop		2	
	Iseilema eremaeum	Flinders grass	1	2	
	Iseilema membranaceum	small Flinders-grass	1	2	3
GRAMINEAE					
	Iseilema vaginiflorum	red Flinders grass		2	
	Monachather paradoxa	bandicoot grass			3
	Panicum decompositum var. *decompositum*	native millet	1	2	
	Paractaenum novae-hollandiae		1	2	
	Paractaenum refractum	bristle brush-grass	1	2	3
	* *Pennisetum villosum*	long-style feather grass		2	
	* *Perotis rara*	comet grass		2	
	Setaria dielsii	Diel's pigeon-grass		2	
	Setaria surgens				3
	Sporobolus actinocladus	ray grass	1	2	
	Sporobolus caroli	yakka grass		2	
	Sporobolus mitchellii	rats-tail couch		2	
	Sporobolus virginicus	salt couch		2	
	Themeda triandra	kangaroo grass		2	
	Tragus australianus	burr grass		2	3
	Triodia basedowii	lobed spinifex	1	2	3
	Triodia irritans	porcupine grass	1		
	Tripogon loliiformis	five-minute grass	1		
	Triraphis mollis	purple heads	1	2	
	Yakirra australiensis	bunch panic	1		3
	Zygochloa paradoxa	sandhill cane-grass	1	2	3
CYPERACEAE					
	Bolboschoenus caldwellii	sea club-rush		2	
	Cyperus bulbosus	bulbous flat-sedge	1		
	Cyperus gymnocaulos	spiny flat-sedge			3
	Cyperus laevigatus	bore-drain sedge			3
	Cyperus victoriensis	yelka		2	
	Eleocharis pallens	pale spike-rush	1	2	

Appendix C Bird Species Recorded from the Simpson Desert Regional Reserve (including the Simpson Desert C P)

Care must be exercised when interpreting the following list because some species are recorded flying over the region and are not normal inhabitants of the sand dune environment. Wetland birds, although not normally found in the dunes, may have been listed during periods in which standing water was available.
Species are listed by common name in taxonomic order of Family using the nomenclature of (Parker and Horton 1990). Subspecies are not listed unless they are morphologically distinct enough to be accurately identified in the field.
Conservation status codes are shown in bold following the common name. The first code is the Australian status according to the *Endangered Species Protection Act 1992* (Australia 1992) (based on the ANZECC list of Threatened Species, August 1998); the second is the State status according to the South Australian *National Parks and Wildlife Act 1972* schedule.
Status code definitions are:

- **E Endangered - taxa in danger of extinction and whose survival is unlikely if the causal factors continue .**
- **V Vulnerable - taxa believed likely to move into endangered category in the near future if the causal factors continue operating.**
- **R Rare - taxa with small populations in South Australia that are not at present endangered or vulnerable but are at risk.**

The columns indicate the source of bird species records as follows:
1. South Australian Environmental Database 27 August 1998 (administered by Planning SA).
2. Records from the South Australian Museum 10 September 1998
3. Listed in the Simpson Desert Conservation Park Draft Management Plan, 1983.

*** Introduced species**

Scientific Name	Common Name	Source		
CASUARIIDAE				
Dromaius novaehollandiae	Emu	1		3
PHASIANIDAE				
Coturnix pectoralis	Stubble Quail	1	2	
ANATIDAE				
Anas castanea	Chestnut Teal			3
Anas gracilis	Australasian Grey Teal	1		3
Anas superciliosa	Pacific Black Duck			3
Aythya australis	Hardhead			3
Chenonetta jubata	Wood Duck			3
Cygnus atratus	Black Swan			3
Dendrocygna eytoni	Plumed Whistling-Duck		2	3
Malacorhynchus membranaceus	Pink-Eared Duck			3
Oxyura australis	Blue-Billed Duck			3
Stictonetta naevosa	Freckled Duck			3
Tadorna tadornoides	Australian Shelduck			3
TURNICIDAE				
Turnix velox	Little Button-Quail			3
DACELONIDAE				
Halcyon pyrrhopygia	Red-Backed Kingfisher	1		3

Scientific Name	Common Name	Source		
MEROPIDAE				
Merops ornatus	Rainbow Bee-Eater	1		3
CUCULIDAE				
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo	1	2	3
Chrysococcyx osculans	Black-Eared Cuckoo	1		3
Cuculus pallidus	Pallid Cuckoo	1		3
PSITTACIDAE				
Aprosmictus erythropterus	Red-Winged Parrot		2	
Barnardius zonarius	Ringneck Parrot			3
Cacatua roseicapilla	Galah	1	2	3
Cacatua sanguinea	Little Corella			3
Calyptorhynchus magnificus	Red-Tailed Black Cockatoo			3
Melopsittacus undulatus	Budgerigah	1	2	3
Neophema bourkii	Bourke's Parrot			3
Neophema chrysostoma	Blue-Winged Parrot **-,V**	1		3
Northiella haematogaster	Blue Bonnet	1	2	3
Nymphicus hollandicus	Cockatiel	1		3
Pezoporus occidentalis	Night Parrot **E,E**			
Psephotus varius	Mulga Parrot			3
TYTONIDAE				
Tyto alba	Barn Owl			3
Tyto longimembris	Eastern Grass Owl			3
STRIGIDAE				
Ninox novaeseelandiae	Boobook Owl			3
EUROSTOPODIDAE				
Eurostopodus argus	Spotted Nightjar	1	2	
AEGOTHELIDAE				
Aegotheles cristatus	Australian Owlet-Nightjar	1		3
PODARGIDAE				
Podargus strigoides	Tawny Frogmouth		2	3
COLUMBIDAE				
Geopelia cuneata	Diamond Dove	1	2	3
Geopelia placida	Peaceful Dove			3
Geophaps plumifera	Plumed Pigeon **-,V**			3
Ocyphaps lophotes	Crested Pigeon	1		3
Phaps histrionica	Flock Pigeon **-,V**			3
OTIDIDAE				
Ardeotis australis	Australian Bustard **-,V**			3
RALLIDAE				
Fulica atra	Eurasian Coot			3
Gallinula tenebrosa	Dusky Moorhen			3
Gallinula ventralis	Black-Tailed Native-Hen			3
Porphyrio porphyrio	Purple Swamphen			3
Porzana fluminea	Australian Crake			3
Porzana tabuensis	Spotless Crake **-,R**			3
GRUIDAE				
Grus rubicundus	Brolga			3
SCOLOPACIDAE				
Calidris acuminata	Sharp-Tailed Sandpiper			3
Calidris ferruginea	Curlew Sandpiper			3
Calidris ruficollis	Red-Necked Stint			3
Tringa glareola	Wood Sandpiper			3
Tringa nebularia	Greenshank			3
RECURVIROSTRIDAE				
Himantopus himantopus	Black-Winged Stilt			3
Recurvirostra novaehollandiae	Red-Necked Avocet			3

Scientific Name	Common Name	Source		
CHARADRIIDAE				
Charadrius australis	Inland Dotterel	1	2	
Charadrius mongolus	Lesser Sand Plover			3
Charadrius ruficapillus	Red-Capped Plover		2	3
Elseyornis melanops	Black-Fronted Dotterel	1		3
Erythrogenys cinctus	Red-Kneed Dotterel			3
Peltohyas austalis	Inland Dotterel			3
GLAREOLIDAE				
Glareola maldivarum	Oriental Pratincole		2	
Stiltia isabella	Australian Pratincole		2	3
Scientific Name	**Common Name**	**Source**		
LARIDAE				
Chlidonias hybridus	Whiskered Tern			3
Gelochelidon nilotica	Gull-Billed Tern			3
Hydroprogne caspia	Caspian Tern			3
Larus novaehollandiae	Silver Gull			3
ACCIPITRIDAE				
Aquila audax	Wedge-Tailed Eagle	1		3
Circus approximans	Swamp Harrier	1		
Circus assimilus	Spotted Harrier	1		3
Elanus scriptus	Letter-Winged Kite			3
Hieraaetus morphnoides	Little Eagle			3
Haliastur sphenurus	Whistling Kite			3
Hamirostra melanosternon	Black-Breasted Kite **-,V**			3
Milvus migrans	Black Kite	1	2	3
FALCONIDAE				
Falco berigora	Brown Falcon	1	2	3
Falco cenchroides	Australian Kestrel	1		3
Falco hypoleucos	Grey Falcon **-,V**	1		3
Falco longipennis	Little Falcon		2	
Falco peregrinus	Peregrine Falcon **-,V**			3
Falco subniger	Black Falcon		2	3
PODICIPEDIDAE				
Poliocephalus poliocephalus	Hoary-Headed Grebe	1		3
ANHINGIDAE				
Anhinga melanogaster	Darter			3
PROCELLARIIDAE				
Puffinus gavia	Fluttering Shearwater			3
PHALACROCORACIDAE				
Phalacrocorax carbo	Black Cormorant			3
Phalacrocorax melanoleucos	Little Pied Cormorant			3
Phalacrocorax sulcirostris	Little Black Cormorant			3
ARDEI*D*AE				
Ardea novaehollandiae	White-Faced Heron			3
Ardea pacifica	Pacific Heron			3
Nycticorax caledonicus	Nankeen Night Heron			3

Scientific Name	Common Name	Source		
***THRESKIORNITHIDAE* (*PLATALEIDAE*)**				
Platalea flavipes	Yellow-Billed Spoonbill			3
Platalea regia	Royal Spoonbill		2	3
Plegadis falcinellus	Glossy Ibis			3
Threskiornis aethiopicus	Sacred Ibis			3
Threskiornis spinicollis	Straw-Necked Ibis			3
PELECANIDAE				
Pelecanus conspicillatus	Australian Pelican			3
MALURIDAE				
Malurus lamberti	Variegated Wren	1	2	3
Malurus lamberti assimilis	Purple-Backed Wren		2	
Malurus leucopterus leuconotus	White-Winged Wren	1	2	3
Stipiturus ruficeps	Rufous-Crowned Emu-Wren	1	2	
AMYTORNITHIDAE				
Amytornis barbatus	Grey Grasswren **-,R**		2	3
Amytornis goyderi	Eyrean Grasswren	1	2	3
Amytornis striatus	Striated Grasswren			3
MELIPHAGIDAE				
Acanthogenys rufogularis	Spiny-Cheeked Honeyeater			3
Ashbyia lovensis	Gibberbird	1	2	3
Certhionyx variegatus	Pied Honeyeater			3
Epthianura aurifrons	Orange Chat	1	2	3
Epthianura tricolor	Crimson Chat	1	2	3
Lichenostomus penicillata	White-Plumed Honeyeater	1	2	
Lichenostomus versicolor	Varied Honeyeater	1		
Lichenostomus virescens	Singing Honeyeater	1	2	
Manorina flavigula	Yellow-Throated Miner	1	2	3
Meliphaga plumula	Grey-Fronted Honeyeater			3
Phylidonyris albifrons	White-Fronted Honeyeater			3
PARDALOTIDAE				
Pardalotus rubricatus	Red-Browed Pardalote	1	2	3
Pardalotus striatus	Striated Pardalote			3
ACANTHIZIDAE				
Acanthiza apicalis	Inland Thornbill	1		
Acanthiza uropygialis	Chestnut-Rumped Thornbill			3
Aphelocephala leucopsis	Southern Whiteface			3
Aphelocephala nigricincta	Banded Whiteface	1	2	3
Pyrrholaemus brunneus	Redthroat	1	2	3
Smicrornis brevirostris	Weebill			3
EOPSALTRIIDAE				
Daphoenositta chrysoptera	Varied Sittella			3
Melanodryas cucullata	Hooded Robin	1		3
Microeca leucophaea	Jacky Winter			3
Petroica goodenovii	Red-Capped Robin	1	2	3
POMATOSTOMIDAE				
Pomatostomus superciliosa	White-Browed Babbler	1		3

Scientific Name	Common Name	Source		
CINCLOSOMATIDAE				
Cinclosoma cinnamomeum	Cinnamon Quail-Thrush	1	2	3
Psophodes cristatus	Chirruping Wedgebill	1		3
Psophodes occidentalis	Chiming Wedgebill	1		3
PACHYCEPHALIDAE				
Colluricincla harmonica	Grey Shrike-Thrush		2	3
Oreoica gutturalis	Crested Bellbird	1		3
Pachycephala rufiventris	Rufous Whistler			3
CORVIDAE				
Artamus cinereus	Black-Faced Woodswallow	1	2	3
Artamus leucorhynchus	White-Breasted Woodswallow			3
Artamus personatus	Masked Woodswallow			3
Artamus superciliosus	White-Browed Woodswallow			3
Coracina novaehollandiae	Black-Faced Cuckoo-Shrike			3
Corvus bennetti	Little Crow	1	2	3
Corvus coronoides	Australian Raven		2	3
Cracticus nigrogularis	Pied Butcherbird			3
Cracticus torquatus	Grey Butcherbird			3
Gymnorhina tibicen	Australian Magpie	1		3
Lalage sueurii	White-Winged Triller	1		3
DICRURIDAE				
Grallina cyanoleuca	Magpie-Lark			3
Rhipidura fuliginosa	Grey Fantail		2	3
Rhipidura leucophrys	Willie Wagtail	1	2	3
HIRUNDINIDAE				
Chermoeca leucosternum	White-Backed Swallow	1	2	3
Hirundo neoxena	Welcome Swallow			3
Hirundo nigricans	Tree Martin	1		
Scientific Name	**Common Name**	**Source**		
SYLVIDAE				
Cinclorhamphus cruralis	Brown Songlark	1	2	3
Cinclorhamphus mathewsi	Rufous Songlark			3
Megalurus gramineus	Little Grassbird		2	3
NECTARINIIDAE				
Dicaeum hirundinaceum	Mistletoe Bird			3
MOTACILLIDAE				
Anthus novaeseelandiae	Richard's Pipit	1	2	3
ESTRILDIDAE				
Poephila guttata	Zebra Finch	1	2	3

Appendix D Mammal Species Recorded from the Simpson Desert Regional Reserve (including the Simpson Desert C P)

Species are listed by scientific name in taxonomic order of family using the nomenclature of Kemper and Queale (1990).

Conservation status codes are shown in bold following the common name. The first code is the Australian status according to the *Endangered Species Protection Act 1992* (Australia 1992) (based on the ANZECC list of Threatened Species, August 1998); the second is the state status according to the South Australian *National Parks and Wildlife Act 1972* schedule.

Status code definitions are:

- **E Endangered - taxa in danger of extinction and whose survival is unlikely if the causal factors continue .**
- **V Vulnerable - taxa believed likely to move into endangered category in the near future if the causal factors continue operating.**
- **R Rare - taxa with small populations in South Australia that are not at present endangered or vulnerable but are at risk.**

The columns indicate the source of mammal species records as follows:

1. **South Australian Environmental Database 27 August 1998 (administered by Planning SA).**
2. **Records from the South Australian Museum 10 September 1998**
3. **Listed in the Simpson Desert Conservation Park Draft Management Plan, 1983.**

*** Introduced species**

Scientific Name		Common Name	Source			
DASYURIDAE	***Antechinomys laniger -,R***	**Kultarr**		**2**	***3***	
	Dasycercus byrnei **E,E**	Kowari				
	Dasycercus cristicauda **V,E**	Mulgara	1	2	3	
	Dasycercus hillieri	Ampurta	1			
	Ningaui ridei	Wongai Ningaui	1	2		
	Planigale tenuirostris	Narrow-Nosed Planigale	1			
	Sminthopsis crassicaudata	Fat-Tailed Dunnart	1	2	3	
	Sminthopsis macroura	Stripe-Faced Dunnart	1	2	3	
MACROPODIDAE	*Macropus robustus*	Euro			***3***	
	Macropus rufus	Red Kangaroo	1			
PERAMELIDAE	*Macrotis lagotis* ***V,E***	Greater Bilby			***3***	
MURIDAE	*Leggadina forresti -,**R***	Forrest's Mouse	***1***		***3***	
	Mus domesticus	House Mouse	1	2	3	
	Notomys alexis	Spinifex Hopping Mouse		2	3	
	Notomys cervinus **-,R**	Fawn Hopping Mouse				
	Notomys cf. *fuscus* **E,E**	Dusky-Hopping Mouse			3	
	Notomys mitchellii	Mitchell's Hopping-Mouse			3	
	Pseudomys australis **V,R**	Plains Rat	1			
	Pseudomys desertor **-,R**	Desert Mouse	1	2	3	
	Pseudomys hermannsburgensis	Sandy Inland Mouse	1	2	3	
	Rattus villosissimus	Long-Haired (Plague) Rat	1	2	3	
VESPERTILIONIDAE						
	Chalinolobus gouldii	Gould's Wattled Bat		2	3	
	Nyctophilus geoffroyi	Lesser Long-Eared Bat	1	2	3	
	Scotorepens greyii	Little Broad-Nosed Bat	1	2		
LEPORIDAE	****Oryctolagus cuniculus***	European Rabbit	1			
CANIDAE	****Canis familiaris dingo***	Dingo	**1**		**3**	
	** Vulpes vulpes*	Fox	1			3
FELIDAE	****Felis catus***	Cat	1			3
EQUIDAE	****Equus asinus***	Donkey	1			
CAMELIDAE**	*Camelus dromedarius*	Arabian Camel	1		3	

Appendix E Reptile and Amphibian Species Recorded from the Simpson Desert Regional Reserve (including the Simpson Desert C P)

Species are listed by scientific name in taxonomic order of family using the nomenclature of Edwards and Tyler (1990).

The columns indicate the source of reptile and amphibian species records as follows:
1. South Australian Environmental Database 27 August 1998 (administered by Planning SA).
2. Records from the South Australian Museum 10 September 1998
3. Listed in the Simpson Desert Conservation Park Draft Management Plan, 1983.

REPTILES

Scientific Name	Common Name	Source		
AGAMIDAE				
Ctenophorus isolepis	Military Sand Dragon	1	2	
Ctenophorus nuchalis	Central Netted Ground Dragon	1	2	
Ctenophorus pictus	Painted Dragon	1	2	3
Ctenophorus tjantjalka	Red-Barred Crevice Dragon		2	
Diporiphora winneckei	Canegrass Two-Lined Dragon	1	2	
Pogona vitticeps	Central Bearded Dragon	1	2	3
Tympanocryptis intima	Gibber Earless Dragon		2	
Tympanocryptis lineata	Five-Lined Earless Dragon	1		3
Tympanocryptis tetraporophora	Eyrean Earless Dragon		2	
Tympanocryptis sp.				
GEKKONINAE				
Gehyra purpurascens	Purplish Dtella	1	2	
Gehyra variegata	Tree Dtella	1	2	3
Heteronotia binoei	Bynoe's Gecko	1	2	3
DIPLODACTYLINAE				
Diplodactylus byrnei	Pink-Blotched Gecko		2	
Diplodactylus conspicillatus	Burrow-Plug Gecko	1	2	
Diplodactylus damaeus	Beaded Gecko	1	2	3
Diplodactylus tessellatus	Tessellated Gecko	1	2	
Nephurus levis	Three-Lined Knob Tail	1	2	
Nephurus levisimmus	Smooth Knob-Tailed Gecko	1		
Nephurus sp.		1		
Rhynchoedura ornata	Beaked Gecko	1	2	3
Strophurus ciliaris	Northern Spiny-Tailed Gecko	1	2	
PYGOPODINAE				
Delma tincta	excitable snake-lizard		2	
Delma nasuta	sharp-snouted delma	1	2	
Lialis burtonis	Burton's legless lizard	1	2	3
SCINCIDAE				
SPHENOMORPHOUS GROUP				
Ctenotus ariadne	skink	1	2	

Scientific Name	Common Name	Source		
Ctenotus brooksi	Sandhill Ctenotus	1	2	3
Ctenotus joanae	Black-Soil Ctenotus		2	
Ctenotus leae	Orange-Tailed Fine-Snout Ctenotus	1	2	
Ctenotus olympicus Spotted Ctenotus		2		
Ctenotus pantherinus Leopard Skink	1	2	3	
Ctenotus regius	Eastern Desert Ctenotus	1	2	3
Ctenotus schomburgkii	Sandplain Ctenotus	1	2	
Ctenotus strauchii Short-Legged Ctenotus	1	2		
Ctenotus uber	Spotted Ctenotus	1		
Eremiascincus fasciolatus	Narrow-Banded Sand Swimmer	1	2	
Lerista labialis	Eastern Two-Toed Slider	1	2	
Lerista xanthura	Yellow-Tailed Slider	1	2	
Notoscincus ornatus Ornate Soil Crevice Skink	1	2		
EGERNIA GROUP				
Egernia inornata	Desert Skink	1	2	3
Egernia striata	Nocturnal Desert Skink	1		
Tiliqua multifasciata Centralian Blue Tongue	1	2		
EUGONGYLUS GROUP				
Cryptoblepharus carnabyi	Speckled Wall Skink		2	
Menetia greyii	Dwarf Skink	1	2	
Morethia adelaidensis	Adelaide Snake-Eye	1	2	
Morethia boulengeri Common Snake-Eye		2	3	
VARANIDAE				
Varanus eremius	Rusty Desert Monitor	1	2	
Varanus gilleni	Pygmy Mulga Monitor		2	
TYPHLOPIDAE				
Ramphotyphlops endoterus	Interior Blind Snake	1	2	
BOIDAE				
Aspidites ramsayi	Woma Python	1	2	3
ELAPIDAE				
Oxyuranus microlepidotus	Inland Taipan		2	
Pseudechis australis Mulga (King Brown) Snake	1	2		
Pseudonaja modesta Five-Ringed Snake	1	2		
Pseudonaja nuchalis Western Brown Snake (Gwardar)		2	3	
Pseudonaja sp.		1		
Suta suta	Curl Snake	1	2	

AMPHIBIANS

LEPTODACTYLIDAE				
Neobatrachus centralis	Trilling Frog	1	2	3

Appendix F Recovery Outlines for Listed Species

Souce: ANZECC (ESAC Internet page)

Dasycercus byrnei Kowari Conservation status: Vulnerable: C2a

Former distribution:
Records from SA/NT border near Charlotte Waters, northern SA around Warburton Creek and north of Cooper Creek, south and east of the Simpson Desert, western Qld between the Simpson Desert and Diamantina River south of Boulia. Recorded as being reasonably common in some areas where they have been located, however, no details of overall abundance are available. Its distribution has always been regarded as very patchy.

Current distribution:
Appears to have become extinct to the west of Lake Eyre and the Simpson Desert. Has not been recorded in the NT since 1901 and surveys of areas north of Oodnadatta in SA failed to record presence. The species has also apparently become locally extinct on Sandringham Station (Qld).

Confined to the Lake Eyre Basin outside the Simpson Desert bioregion. Recent records suggest a distribution from north of Cooper Creek; east of Killalpanina to east of the Simpson Desert in Qld; south of Boulia and west of Thomson Creek from around Betoota. Temporal and spatial fluctuations in numbers make it difficult to estimate population size with any certainty but it is apparently only rare across its range.

Habitat:
The species is found in gibber patches in Mitchell grass plains. Preliminary habitat modelling suggests that plant species richness and the number of habitat patches are predictors of Kowari presence during drought within the known range.

Reasons for decline:
A range of threats have been postulated as affecting persistence. The impacts of introduced predators are unknown; however dogs, cats and foxes tend to occupy different habitats being more prevalent on dune areas and drainage lines which Kowari do not appear to prefer. Anecdotal evidence suggests that cattle grazing may negatively impact on the species with the disappearance from Sandringham Station being attributed to altered vegetation communities caused by cattle grazing. Road works and increased vehicular traffic may be negatively impacting on populations.

Dasycercus cristicauda Mulgara Conservation status: Vulnerable: C2a

Former distribution:
Once widespread and common throughout the central deserts region.

Current distribution:
Fragmented into small, discontinuous populations in Queensland, the Northern Territory and Western Australia.

Habitat:
Now found principally in mature hummock grasslands (spinifex). Available information suggests that colonies coincide with better watered areas such as palaeo-drainage systems or drainage lines in sandplain or sand dune habitats.

Reasons for decline:
Major threats are unknown but are probably related to habitat destruction by changed fire regimes and introduced herbivores such as cattle and rabbits, and predation by feral cats and foxes.

Dasycercus hillieri Ampurta Cons. status: Endangered: B1+2d,3b,c

Former distribution:
Uncertain due to the confusion of the two species. Believed to have been common in the eastern and southern Simpson Desert region of SA, Qld and the NT. Early specimens from the Canning Stock Route, WA, and the Musgrave Range, SA, are believed to be this species.

Current distribution:
Recorded from Purni Bore and Horses Hill area (SA) in 1990. Found on Sandringham Station (Qld) in 1968 but has not been seen there since (Woolley 1990). Status in WA unknown.

Habitat:
Found in mature hummock grasslands (spinifex) and cane grass on sand dunes.

Reasons for decline:
Major threats are unknown but are probably related to habitat destruction by introduced herbivores such as sheep, cattle, camels and rabbits, predation by feral cats and foxes, and changing fire regimes.

Notomys fuscus Dusky Hopping-mouse

Species Survival Status:
IUCN Vulnerable: taxon with populations that have been seriously depleted and whose ultimate security is not yet assured.

Mace and Lande Vulnerable: recent capture rates suggests N<10 000. Like other arid zone rodents, subject to periodic population fluctuations.

CITES listing: I.

Former Distribution:
South Australian and Western Australian margins of the Nullarbor Plain, Lake Eyre Basin of northern South Australia, southern Northern Territory and south-western Queensland.

Current Distribution:
North-eastern South Australia (southern Strzelecki Desert and the Cobblers Desert) and south-western Queensland. Since 1985, specimens have been collected from Carraweena, Montecollina Bore and Quinyambie Station, South Australia, and from Pelican Waterhole, south-western Queensland.

Habitat:
Sand ridge habitats, which alternate with gibber flats and clay pans, in the Pelican Waterhole area. Sympatric with *Notomys cervinus*; *N. fuscus* burrows only on the sand dunes while *N. cervinus* burrows in clay soils.

Reason for decline:
Not known.

Conservation Reserves in which species occurs
Not recorded in existing reserves. Similar habitats to those in which the species has been recorded occur in the adjacent Strzelecki Regional Reserve, which is likely to be extended to include Montecollina Bore.

Other public lands on which species occurs
Pastoral leases in north-eastern South Australia and south-western Queensland.

Pseudomys australis Plains Rat

Species Survival Status:
IUCN Vulnerable: taxon with populations that have been seriously depleted and whose ultimate security is not yet assured.

Mace and Lande Vulnerable: recent capture rates suggests N<10 000. Like other arid zone rodents, subject to periodic population fluctuations.

CITES listing II.

Former Distribution:
Patchy distribution over northern South Australia, southern Northern Territory, central and south-western Queensland, south-eastern Western Australia, southern Eyre Peninsula and Lake Albert (SA), northern New South Wales and southern Victoria.

Current Distribution:
Patchy distribution in the western Lake Eyre Basin from Billa Kalina Station, south-east of Coober Pedy, to Charlotte Waters, Northern Territory.

Habitat:
Gibber plains with cracking clay depressions supporting perennial Atriplex/Maireana open shrubland (Todmorden and Macumba Stations; Witjira National Park), and cracking clay plains dominated by low Sclerolaena sub-shrubs (Billa Kalina Station; Moon Plain north of Coober Pedy).

Reason for decline:
Probably due to the impacts of introduced stock and rabbits on vegetation.

Conservation Reserves in which species occurs:
Witjira National Park, South Australia.

Other land on which species occurs
Whole specimens collected at Macumba, Mt Barry, Billa Kalina, Hamilton and Copper Hills Pastoral Leases since 1990. Remains in recent owl pellets have been recorded from Eringa Waterhole (Eringa Pastoral Lease), Abminga Rail Siding (Tieyon Pastoral Lease), Pedirka Rail Siding (Hamilton Pastoral Lease), Old Peake Telegraph Station (The Peake Pastoral Lease).

Appendix G Multiple Use Conservation Areas – General Discussion

Australia signed the Convention on Biological Diversity on World Environment Day, 5 June 1992, at the Earth Summit in Rio de Janeiro and ratified it on 18 June 1993. The Convention was developed in recognition of the present and future value of biological diversity and its significant reduction around the world. The convention provides a framework for global action to conserve and sustainably use biological diversity. The overall objectives of the Convention are the **conservation of biological diversity**, the **sustainable use** of its components and the **fair and equitable sharing of the benefits arising out of the utilisation of genetic resources**. Though the legislation predates the signing of this Convention, it is within this context that the *National Parks and Wildlife Act 1972* and its provisions operates.

The concept of multiple use conservation areas has been in operation for many years in many countries around the world. For example, since 1949 in Great Britain the National Parks Authority has had two statutory purposes:

- Conserving and enhancing the natural beauty, wildlife and cultural heritage of the national parks, and
- Promoting opportunities for the enjoyment and understanding of the special qualities of those areas by the public

National Parks in Britain are 'national' in the sense that they are of a national value and importance, but they are not nationally owned. The designation of an area as a National Park does not affect the ownership of the land, neither does it remove the rights of local communities or infer special rights to the public.

It may be considered incompatible with landscape and nature conservation to have land in private ownership and to have economic landuses in a designated area, however, the International Union for Nature and Natural Resource Conservation (IUCN) acknowledges that a high proportion of the natural beauty and biological diversity in the world occurs in areas occupied and used by people. In recognition of this, IUCN established a category of protected landscapes.

Category VI Protected Areas (IUCN 1994) are defined as 'areas containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs'.

The key words here are **sustainable** with respect to production objectives, and **protection and maintenance** with reference to biological diversity.

The workability of this multiple-use concept is totally dependant on a management plan which clearly defines the limits of sustainability and what constitutes adequate protection.

Regional Reserves in South Australia are constituted under the provisions of the *National Parks and Wildlife Act 1972*. This legislation has provision for the regional reserve classification to be altered to another class of reserve.

The *National Parks and Wildlife Act 1972* provides for agreements between the Minister for Environment Heritage and Aboriginal Affairs and the Minister for Primary Industries and Resources and holders of mining tenements to prescribe the way in which natural resources will be utilised in Regional Reserves. These agreements recognise, and make provisions for the conservation values of these lands.

All other provisions of the *National Parks and Wildlife Act 1972* apply to Regional Reserves.

Appendix H Land System Descriptions

These land systems have been described in more detail in. the Marree Soil Conservation District Plan (Board 1997), and evolved from some earlier research by CSIRO (Graetz et al. 1982).

Wangkangurru land system (approximately 45% of Simpson Desert Regional Reserve area)

Extensive regular, linear sandridges of the central Simpson Desert, with sandy interdunes and an absence of playa lakes. Dune density is high and disorganised dunes occur in the central area (Graetz et al. 1982; Purdie 1984).

Sandridges are soft, red siliceous sands with mobile crests and stable slopes. The mobile crests have a sparse cover of sandhill canegrass; lobed spinifex dominates dune flanks, with patches of sandhill wattle.

Interdunes are firm red siliceous sands, which merge into dune backslopes and footslopes. Hummock grassland of lobed spinifex dominates where the sand is >50 cm deep, with scattered sandhill wattle, sandplain wattle and narrow-leaved hopbush. Wider-spaced dunes expose reddish sandy clays or clays in the interdunes. Vegetation on these clays is either a very sparse grassland (kerosene grasses) with scattered prickly wattle, Oswald's wattle, sennas and long-leaved eremophila; or infrequently a low open shrubland of bladder saltbush or low bluebush (Graetz et al. 1982; Purdie 1984).

Tirari land system (approximately 45% of Simpson Desert Regional Reserve area)

Very long parallel sandridges, swales, interdune flats and small to large salinas and playa lakes of the Tirari Desert, the southern and central Simpson Desert, crossed by the narrow floodplains of the Kallakoopah, Warburton and Cooper Creeks. This Land System extends from east of Lake Eyre northwards to the Northern Territory border.

The Land System is dominated by the longitudinal northerly trending sandridges of the Tirari Desert and the central Simpson Desert. Dune spacing varies from 150m in the south to >1km in the north. Dunes are 10-15m high increasing to 20m in the north, comprising of pale reddish or brownish quartz sands with carbonate nodules at depth, and some clay in their lower profiles. Crests are generally mobile or semi-mobile.

The main vegetation cover is open hummock grassland of sandhill canegrass. Sparse sandhill wattle may be present, and needlebush becomes frequent north of the Warburton. Major ephemerals appearing briefly after rain include kerosene grasses, button grass, buckbush, desert caltrop and poached-egg daisy. The ephemeral cover does not persist.

Narrow interdunes also have sand or clayey sand soils, with similar very sparse vegetation. Where interdunes are wider, soils become sandy loams or sandy clay loams. In the southern part there is usually a perennial low open shrubland of starbush, a relatively short-lived species, with pockets of nitrebush, low bluebush or bladder saltbush. Bladder saltbush is more frequent in open interdunes in the northern part. Salt and short-winged copperburrs and neverfail are present as short-lived perennials. Common ephemeral species, appearing after rain, include buckbush, spinach, plate grass, common bottlewashers and kerosene grass.

Stony duplex soils, of brown calcareous loams over calcareous sandy clay, are present in wider interdunes. These support a perennial low open shrubland of low bluebush with cottonbush, and

occasionally bladder saltbush. Groves of spotted emubushes and isolated sandhill wattle are frequent north of Warburton Creek, but decrease to the south. Some at least of these soils are gypseous. Kopi outcrops appear in places, with a shrubland of sandhill wattle, prickly wattle and desert cassia.

Large playa lakes and some salinas are present throughout, but more frequent north of the Warburton. Soils of the playa surfaces are puffing clays with salt deposits, or thin crusts on the salinas, and are unvegetated. The immediate fringing vegetation is perennial shrubland of samphire.

Kallakoopah land system (approximately 2% of Simpson Desert Regional Reserve area)

The lower reaches and saline floodplains of the Macumba, Warburton and Kallakoopah Rivers, and associated dunefields, on the northern margin of Lake Eyre North. It consists of low, irregular shaped dunes of whitish sand, salinas and claypans. The dunes of this system are derived from sand and clay sources in Lake Eyre, the rivers and salinas, and often have consolidated bases which show evidence of active erosion (Purdie 1984).

The flood plains have grey self-mulching cracking clay soils. Vegetation depends on soil salinity. Less saline soils carry a variety of low chenopod shrublands with grasses. More saline areas have a cover of ephemeral forbs, with growth only when flood or heavy rainfall reduces the surface soil salinity temporarily (Graetz et al. 1982).

Channels, swamps and lagoons have soils ranging from grey siliceous loams to the heavy clays of the floodplains. Vegetation cover depends on salinity. Tall open chenopod shrubland dominated by old man saltbush occurs along channels where the soil and water are least saline. White teatree swamps are present in more saline areas, and highly saline areas have a samphire cover (Graetz et al. 1982).

Dunes are irregular, mobile or semi-mobile on crests, and are deep, yellow-white loose siliceous sands. Crests support hummock grassland of sandhill canegrass, with lobed spinifex on the flanks. Isolated sandhill wattle and senna occur with increasing frequency towards the north. Interdune flats are yellow firm siliceous sands, carrying largely ephemeral open grassland with copperburrs. Isolated mulga and needlewood also occur.

Jeljendi land system (approximately 8% of Simpson Desert Regional Reserve area)

Very long, high and widely spaced longitudinal sandridges with a north northwest trend, overlying the ancient (non-active) floodplain of Eyre (Fatchen and Barker 1979a; Fatchen and Barker 1979b; Graetz et al. 1982; Purdie 1984). Dunes are deep red siliceous sands, with mobile crests. Vegetation is perennial hummock grassland of sandhill canegrass on crests and upper slopes, with lobed spinifex appearing on lower slopes. Present also on slopes are scattered sandhill wattle, waxy wattle, sandplain wattle, and horse mulga (Purdie 1984). The brown clays of the ancient floodplain are at least partially exposed between most dunes.

Appendix I Introduced Mammals – regional context

There are nine species of introduced mammals currently present in the Simpson Desert (Appendix D). The most influential are the European Rabbit (*Oryctolagus cuniculus*) and the Arabian Camel (*Camelus dromadarius*). Although rabbits were released in Australia in 1858, they were not recorded in this region until the turn of the century near the fringe of the desert in Queensland (Shephard 1992). The presence of abundant rabbit bones at Aboriginal campsites suggests that rabbits may have been present before 1900 (Hercus and Clark 1986). As is the case with other desert animals, the density of rabbit populations appears to reflect the unpredictable nature of rainfall patterns. Explorers Madigan and Colson both noted that there was a distinct absence of rabbits in the desert in the 1930s. Similarly, (Fatchen and Barker 1979a) reported only isolated colonies in 1972. However, from 1973 to 1976 the desert experienced unusually high rainfall, and the resulting vegetation growth promoted a significant increase in rabbit populations (Alexander 1981; Buckley 1979). In the following years, the effects of rabbit grazing were obvious with almost complete removal of ground cover (Pech and Graetz 1982).

Rabbits have proved difficult to control in the desert. Populations become mobile in search of ephemeral vegetation emerging after localised rains and hence there are no core areas to target controls. The success of myxomatosis was limited by the extent of summer rains which control the mosquito breeding sites (Bartholomaeus 1991). Initial work with the Spanish rabbit flea (*Spilopsyllus cuniculi*) in 1986 was also unsuccessful (Bartholomaeus 1991)**.**

In 1994, there was a sudden decline in the rabbit population within the Simpson Desert following drought (Friebe and Friebe 1998). This, combined with the spread of rabbit calicivirus disease (RCD) in 1995, wiped out almost all of the rabbit population. RCD was re-released at Bollard's Lagoon south east of the Simpson Desert Regional Reserve in August 1997. RCD has been found on pastoral properties to the southeast and southwest of the desert and it is assumed that it is also active within the Regional Reserve (Greenfield 1998). In addition to RCD, Spanish rabbit fleas were re-released in February 1998 at Bollard's Lagoon and further south at Quinyambie. Members of Friends of the Simpson Desert voluntarily undertake RCD checks, which involves searching for warrens, faecal material and dead animals. A consequence of the decline in the rabbit population has been the decline in a number of local raptors, particularly the Wedge-Tailed Eagle and the Dingo population.

After the rabbit, the House Mouse (*Mus domesticus*) is the most common mammal in the desert. It is found in all land systems but appears to prefer areas of runoff or those that retain moisture for longer periods after rain. Similar to the other desert dwelling mammals, population growth and decline are in response to the fluctuating natural cycles (Gibson and Cole 1988).

The camel was introduced into Australia in 1840 and was used for nearly a century as the primary mode of inland transport (Strahan 1983). With the advent of motorised transport, the camel was no longer necessary, and herds were either shot or set free, subsequently forming feral herds. In 1984 the population within the Simpson Desert was estimated to be 10 700 at an average density of 0.13 animals per square kilometre (Gibson and Cole 1988). The grazing and browsing by camels are the primary impact, and may alter small native mammal's habitat (Strahan 1983).

The principal concern in relation to camels is their destruction of fences on pastoral leases which border the Simpson Desert Regional Reserve. This occurs when animals attempt to move along watercourses, particularly during periods of drought. As a result, pastoralists with properties bordering the Simpson Desert, in conjunction with Government Agencies, are periodically involved in camel control (Campbell 1998).

Feral cats were first recorded on the Field River in 1884. Along with the dingo (introduced by Aborigines at least 3 450 years ago [Walton and Richardson 1989]), the feral cat is the principal predator in the desert. General observations by visitors to the desert suggest that dingo numbers have declined in recent years (Friebe and Friebe 1998). This may be correlated to a decline in the local rabbit population following the introduction of RCD. Donkeys, horses and cattle may enter the Simpson Desert Regional Reserve but they are generally restricted to the desert margins and rarely enter the desert proper.

Appendix J Aboriginal Occupation – regional context

The major sandridge deserts, including the Simpson Desert, were probably the last areas of the Australian continent to be inhabited (Shephard 1992). It is believed by archaeologists that the Simpson Desert was only occupied on a permanent basis within the last 5000 years (Veth 1989). Living in the desert required a number of adaptations and changes to Aboriginal lifestyle, such as the exploitation of seed as a staple food source, the development of tools necessary to process seeds and the ability to conserve and maintain the limited water supply (Veth 1989).

Several groups included part of the Simpson Desert within their tribal boundaries. The Lower Southern Aranda and Eastern Aranda people occupied the western desert margins, while the Karangaru and Wangkamadla lived along the eastern fringe of the desert. The Wangkamadla also extended into the northern areas of the desert. The Wangkangurru were the dominant tribe of this region, and occupied the central and southern central sections of the Simpson Desert (Planning 1983). (Tindale 1974) estimated that tribal populations were about 400-600. This is in contrast to the belief held until recent times that the central Simpson Desert was never occupied because it was too inhospitable (Boyland and Ogilvie 1966; Latz and Griffin 1977).

Aboriginal people were able to live in the centre of the desert by using wells, or *mikiri*, because they were the only source of permanent water available. The *mikiri* were shallow freshwater soaks in low-lying depressions on gypseous flats between dunes.

Mikiri were the sites of most activity. This is evident from humpies or *wiltjas*, burial sites and stone and wooden artifacts found around them (Shephard 1992). In good seasons the Wangkangurru were able to leave the wells and move across the desert relying on secondary water sources eg claypans (*irpi*) and swamps (*ikara*). Such periods also allowed for a change in diet and the exploitation of new resources. Time away from the wells allowed them to recover from the impacts of permanent occupation (Shephard 1992).

A total of 18 *mikiri* have now been identified and described (Hercus 1990), however most are now filled in as a result of lack of maintenance and the movement of drift sand (Shephard 1992). The preservation of these sites has been through natural processes, a combination of the drifting sands covering them as well as a lack of human visitation. Seismic exploratory work did not significantly affect any of these well sites directly, except where one seismic line passed within 500m of the well (Hercus 1998; Potezny 1998).

The people of this region were involved in extensive trade, much of which was centred on a deposit of red ochre in the northern Flinders Ranges near Parachilna. Many myths and dreaming stories are directly associated with these trading routes. Sandstone grinding stones were also obtained from quarries south west of the desert, principally Palthirri Pithi on Anna Creek Station (Hercus 1985; Hercus and Clark 1986). In addition, ground edged axes made from Mt. Isa dolomite were obtained from quarries in Queensland (Griffin and McCaskill 1986). Another possible trading item was pitcheri, a plant chewed for its narcotic properties (South Australian Department of Environment and Planning 1983).

Initial contact with non-Aboriginal people would have been through trade routes in the north and south. David Lindsay was presumably the first to communicate directly with the Wangkangurru on their homeland (Shephard 1992). The problems encountered with surviving in the desert meant

that the regular supplies of food and water from stations and missions beyond its fringes were attractive. The Wangkangurru gradually left the desert, with the last members vacating around 1899 - 1900. Whilst visits have been made since, there has been no permanent residence. There was a steady decline in the populations of all Aboriginal people in the Lake Eyre Basin during the first two decades of this century with the influenza epidemic in 1919 having significant effects. By the mid 1970s only 3 Wangkangurru people born in the desert were alive. All have since died (Shephard 1992).

Appendix K Petroleum Exploration

History

The following information has been primarily extracted from Alexander and Hibburt (1996).

The potential of the Simpson Desert as a petroleum source was first noted by Sprigg (1958) when he concluded that the sediments of the Great Australian Basin had been laid down during conditions favouring the creation of oil. Petroleum exploration commenced in South Australia in the following year with the granting of Oil Exploration Licenses (OELs) 20 and 21 to Delhi Australia Ltd. and Santos Ltd. on the 1st March 1959. However, it was not until 1963 that exploration commenced in the western sector of the Simpson Desert when Delhi-Santos farmed out an area to French Petroleum. In the ensuing three years French Petroleum contracted a number of companies to carry out extensive gravity and seismic surveys. *Mokari 1*, completed on 28th May 1966, was the only drillhole during this period in what subsequently became the Simpson Desert Regional Reserve. Upon completing the gravity and seismic surveys and the drilling of a number of other stratigraphic drillholes, French Petroleum concluded that the Permian strata within the Simpson and Pedirka Basins did not house good petroleum reservoirs. Upon ceasing work in this region in 1966, seismic surveys had covered over 7000 km (Figure i).

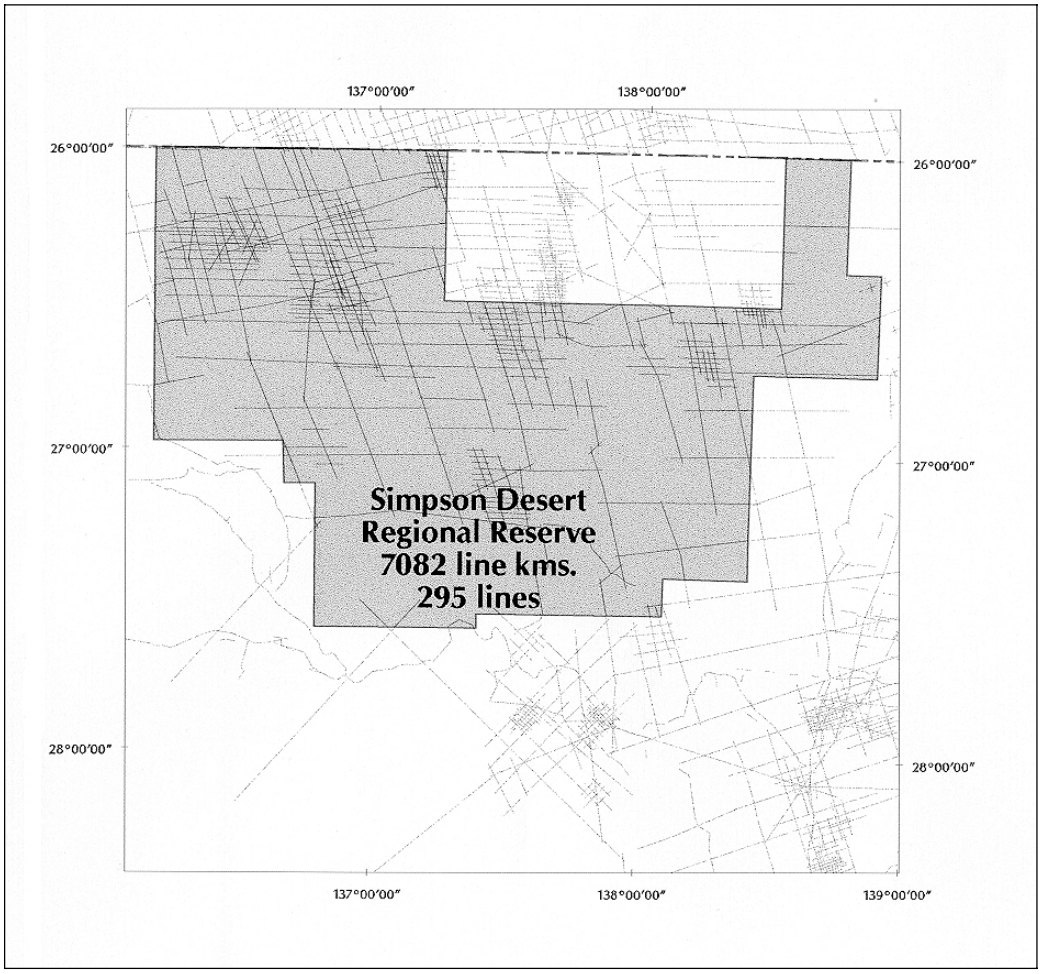

Figure i Seismic surveys conducted before 22 December, 1988. No seismic surveys have been undertaken since 22 December, 1988.

In 1973, Western Mining Corporation began seismic surveys in the Simpson Desert in accordance with a farmout agreement with Delhi-Santos-Vamgas-Total Exploration under what had become Petroleum Exploration Licenses (PELs) 5 and 6. This culminated in two drillholes being drilled in the Simpson Desert in 1977, *Macumba 1* (2/08/77) and *Poolowanna 1* (15/10/77), the first since the initial drillhole at *Mokari 1*. *Macumba 1* was dry and consequently abandoned and *Poolowanna 1*, located within the Simpson Desert Conservation Park, produced the first oil flow from the Eromanga Basin in South Australia. This flow was not connected to a reservoir containing commercial quantities of oil and has subsequently been abandoned. Drilling was allowed within the Simpson Desert Conservation Park because of the pre-existing rights of PELs 5 and 6.

In 1979, the exploration rights of Delhi-Santos were reviewed resulting in the areas covered by PELs 5 and 6 being halved. The remaining regions were divided into the Arrowie, Cooper and Pedirka Sectors, the Pedirka Sector containing the Simpson Desert.

In 1981 there were three drillholes completed, *Walkandi 1* (20/09/81), *Erabena 1* (19/11/81) and *Kuncherinna 1* (30/12/81). Since February 1984, PELs 5 and 6 have been subject to 25% relinquishment at five-year intervals.

From 1984 to 1986 Delhi-Santos proceeded with extensive exploratory works within the area that was to become the Simpson Desert Regional Reserve. This included the completion of 5 drillholes in 1985, *Poolowanna 2*, within the Simpson Desert Conservation Park (19/04/85), *Oolarinna 1* (27/05/85), *Killumi 1* (25/06/85), *Glen Joyce 1* (01/08/85) and *Miandana 1* (24/08/85). All were eventually plugged and abandoned. In total, there were 11 exploration drillholes completed within the Simpson Desert (including the Conservation Park) prior to the proclamation of the Regional Reserve in 1988 (Figure ii).

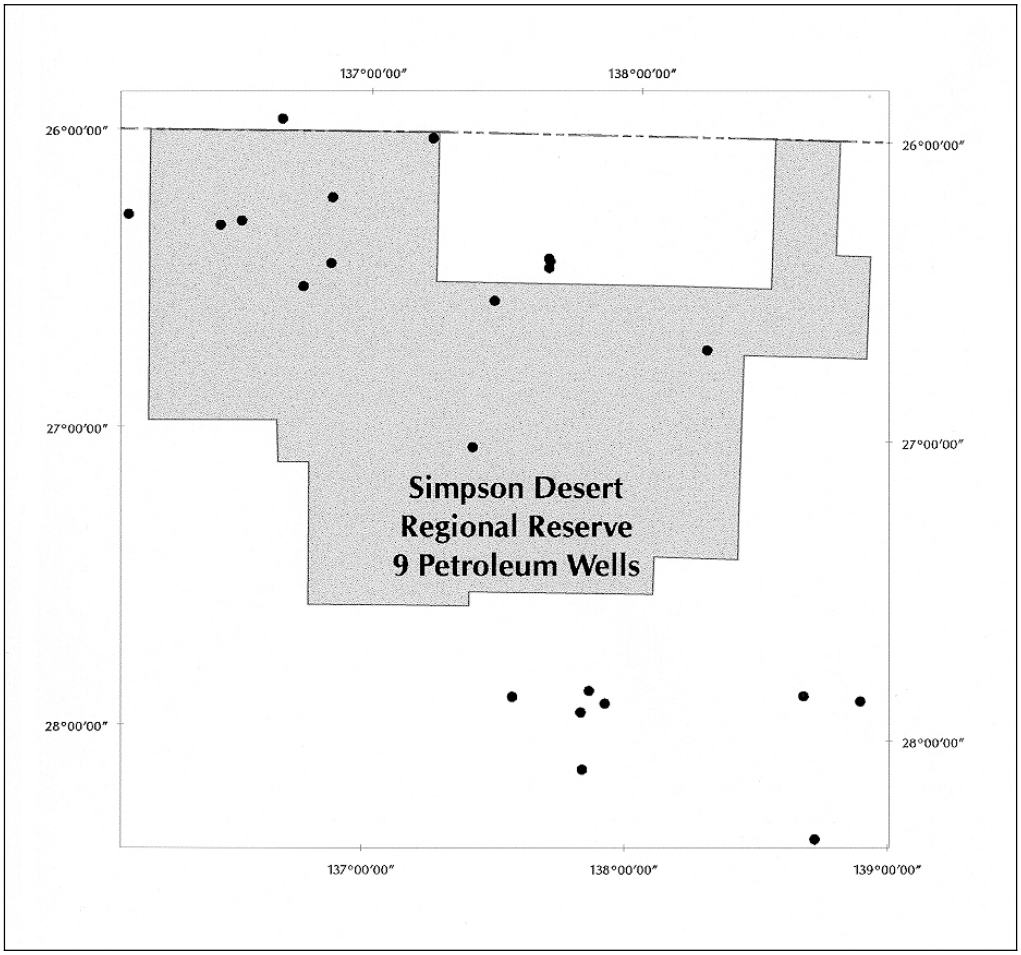

Figure ii Wells drilled before 22 December, 1988. One well (Poolowanna 3) was drilled in the Simpson Desert Conservation Park in March, 1989.

Petroleum Exploration Licenses 49 and 50

These licenses are under an application for renewal dependent on Felstea identifying a new farm-in partner and submitting a new work program. If the licenses are renewed 2303 km^2 and 2429 km^2 must be relinquished from PELs 49 and 50 respectively. All other potential license blocks in the Simpson Desert Regional Reserve are located in areas currently subject to Native Title claims and consequently no licenses have been issued (Langley 1998).

Possible Future Pipeline Scenarios

The Northern Territory Government has set aside land near Darwin for a facility to process offshore gas deposits for sale as Liquid Propane Gas into the South East Asian markets. This is highly dependent on a number of factors, the economic situation in South East Asia and the price of petroleum products being major considerations.

A proposal has been made to extend the existing pipeline between Darwin and Alice Springs further south to Moomba. This would link the offshore Darwin gas to the Adelaide, Melbourne, Sydney and Brisbane markets. Should this proposal be successful, the Alice Springs to Moomba section could traverse the Simpson Desert Regional Reserve and a detailed environmental impact assessment would need to be undertaken (Langley 1998).

Legislative requirements, agreements and regulatory controls

All companies involved in petroleum exploration or production in South Australia must adhere to the previsions of the *Petroleum Act 1940* (South Australia 1940). In October 1989 new regulations were made under the Act and an environmental assessment and a Code of Environmental Practice (CEP) became mandatory before exploration and development operations can be approved.

Any CEP for seismic operations in the Cooper and Eromanga Basins submitted under Petroleum Regulation 16(4) of the *Petroleum Act 1940* (South Australia 1940) must include a commitment to achieve three objectives as outlined in Primary Industries and Resources South Australia's (PIRSA) *Statement of Environmental Objectives for Seismic Operations in the Cooper and Eromanga Basins, South Australia.*

These objectives are:

- Ensure that the potential impacts of the proposed seismic operation on biological diversity and cultural components of the environment are assessed within a planning process and incorporated into field management procedures.
- Monitor and manage those activities that have, or are likely to have, temporary impacts on biological diversity, cultural components of the environment, ground water or other land users and facilitate rehabilitation to minimise such impacts if they occur.
- Avoid undertaking any activities which have, or are likely to have, long-term significant adverse impact on biological diversity, cultural components of the environment, ground water or other land users.

Achievement of these objectives is assessed by one of the following methods:

- goal attainment scaling
- defined conditions
- scientific surveys
- photo-monitoring, and
- other techniques as appropriate.

Santos, as the operator, on behalf of the joint venture parties within PELs 5 and 6 has prepared CEPs along with a series of Environmental Procedures which describe methods for achieving these environmental objectives. Santos has deemed these appropriate for use in all of their onshore operational areas within Australia. PIRSA recommends that any companies wishing to undertake exploration within the Cooper and Eromanga Basins adhere to the CEP and Environmental Procedures proposed by Santos. It is also a legislative requirement that CEPs be reviewed every three years.

PIRSA believes that the objectives outlined in the *Statement of Environmental Objectives for Seismic Operations in the Cooper and Eromanga Basins, South Australia* are suitable for use within Regional Reserves (Cockshell 1998).

Appendix L Tourism and Recreation – regional context

The first successful non-indigenous crossing of the Simpson Desert was made by Edmund Colson in 1936, followed 3 years later by Madigan. Dr. Reg Sprigg completed the first motorised crossing of the Simpson Desert in 1962. The construction of the French Line by the exploration company French Petroleum Pty. Ltd. from Dalhousie Springs to Poeppel Corner in 1963 greatly increased the accessibility of the region. Despite further crossings by Sprigg and his family and the well publicised crossings of the Leyland Brothers in the mid 1960s, it was not until 1971 that the first commercial party of tourists crossed the desert.

This expedition was organised by Transcontinental Safaris and lead by one of its proprietors, Rex Ellis. Travellers were taken from Oodnadatta to Dalhousie, across the Simpson Desert to Birdsville and then returned to Adelaide. This trip received much publicity, partly due to the difficulties encountered by the party, and as a result heightened the public awareness of the region. This journey initiated a relative flood of activity from individuals wanting to cross one of the last Australian frontiers. The past and present challenge in many cases has become the method by which individuals traverse the desert, for example boat (Ellis 1982), walking (Bonython 1980), camel (Ellis 1982), foot race (Wright 1986) and more recently by bicycle (Kriven 1987).

Appendix M **Economic Assessment Report**

Economic Assessment of the Simpson Desert Regional Reserve

A report prepared for

Department of Environment, Heritage and Aboriginal Affairs

Prepared by

EconSearch Pty Ltd

October, 1998

EconSearch Pty Ltd
PO Box 1148, Stirling SA 5152
Tel: (08) 8357 9560
Fax: (08) 8373 2442
E-mail: econsrch@camtech.net.au

Contents

1. INTRODUCTION

1.1.1. Background

The *National Parks and Wildlife Act 1972* was amended in 1987 to provide for a classification of reserve known as 'Regional Reserve'. This classification allows the Government to manage land for conservation of wildlife, and natural and historic features while permitting utilisation of natural resources, thereby enabling multiple land use of the reserve.

The regional reserve mechanism provides for:

- a conservation focus
- conservation management planning and implementation
- security of tenure for lands reserved under the Act, and
- regulation for the management of human activity.

Major objectives for regional reserve management are to establish strategies that successfully integrate the different uses for which the reserve has been proclaimed.

The purpose of this review is to meet the requirements under the *National Parks and Wildlife Act 1972* (Section 34A (5)). These requirements are that within ten years of the constitution of Simpson Desert Regional Reserve (ie by the 22nd of December 1998), a report must be laid before each House of Parliament which:

- assesses the impact of the utilisation of natural resources on the conservation of the wildlife and the natural and historic features of the reserve
- assesses the impact or the potential impact of the utilisation of the natural resources of the reserve on the economy of the State, and
- makes recommendations as to the future status under the Act of the land constituting the reserve.

EconSearch Pty Ltd, in association with World Wide Project Management Services Pty Ltd, was commissioned to provide an assessment of the impact and potential impact of the utilisation of the natural resources of the Simpson Desert Regional Reserve (SDRR) on the local economy and the economy of the State. The Department for Environment, Heritage and Aboriginal Affairs commissioned the study.

There is particular interest in 'resource constraints' and some of the 'potential incompatibilities in land use' such as tourism/mining/environment conflicts (water, land, skills, investment dollars).

An important aspect of the project has been the development of a data collection and collation process. A major outcome is a set of recommendations as to how data should be collected to streamline future Regional Reserve Ten Year Reviews.

1.2. Terms of Reference

The terms of reference of the consultancy required that the following tasks be undertaken.

1. Assess the impact or potential impact of the utilisation of the natural resources of the Simpson Desert Regional Reserve on the economy of the State.
2. Determine the actual, relative and potential importance on the State's economy of each of the major industries utilising the resources of the reserve.
3. Include gross State product including direct and indirect cost and benefits, employment and occupations and changes in occupation.
4. Make recommendations as to how data should be collected to stream line future Regional Reserve Ten Year Reviews.

1.3. Outline of the Report

The following sections of this report provide:

- a description of the approach to the conduct of the study (Section 2)
- details of the socio-economic profile of the region (Section 3)
- a brief description of the industries utilising the resources of the reserve (Section 4)
- a report on the economic impact of industries utilising the resources of the reserve (Section 5)
- a discussion of resource use conflicts and the impact of development initiatives (Section 6)
- a statement on economic outlook in the context of the industries utilising the resources of the reserve (Section 7), and
- recommendations on data requirements and analytical frameworks for future ten-year reviews of regional reserves (Section 8).

2. METHOD OF ANALYSIS

2.1. Data Collection

This involved five main steps:

1. There was information provided by the client to the consultant including:
   - basic information on the region from industry and government agencies which operate within the SDRR
   - existing information (published or unpublished) of relevance to the project that is readily available (including maps), and
   - specific information on the possible future developments with in the region.
2. Population census data were obtained from the Australian Bureau of Statistics (ABS) at a collectors district level (population, age distribution, education, employment by industry, occupation, family income, etc.). The data were provided in the form of 'Community Profiles' from the ABS and were obtained for at least two collectors districts, one which covers the SDRR and a second for the township of Oodnadatta.
3. Other social and economic data for the broader region, the Far North Statistical Sub-Division, was collected (regional employment by industry [4 digit ANZSIC], industry output/turnover, wages and salaries, household consumption, etc.).
4. Consultation was undertaken with representatives from industry and government which operate within the SDRR to establish information about trade flows to and from the region, the source of inputs to the reserve, future development potential in the region and current and potential resource conflicts in the reserve.
5. A review of existing literature on resource valuation was undertaken.

2.2. Regional Input-Output Table

There are two models that were prepared as part of this task:

1. Data collected as described in Section 2.1 were used to generate an input-output table for the Unincorporated Far North (a region smaller than this would not be meaningful in an economic sense). The Unincorporated Far North is the Far North Statistical Subdivision excluding the towns of Coober Pedy and Roxby Downs. Details of the input-output methodology and its application are provided in Attachment 1.
2. EconSearch had already developed an input-output table for the State as a whole. This model was available for use in the study to measure economic impacts at the State level to complement the regional level impact assessment. Some relatively minor adjustments were made to the existing State model to enable the assessment of Regional Reserve economic impacts.

2.3. Socio-Economic Profile of the Region

The collection of base data and the construction of a regional input-output table enabled the preparation of a socio-economic profile of the local area. The combined data sets allowed preparation of information on:

- output and employment by industry
- trade flows to and from the region
- demographic details
- the contribution of the reserve to the State economy, and
- sources of inputs to the reserve.

2.4. Economic Impact of Industries Utilising the Resources of the reserve

The input-output models (local and State) were used to assess the economic significance of industries utilising the resources of the SDRR. On an industry by industry basis, major social and economic indicators were provided, namely:

- value added (gross state product)
- business turnover
- employment (including industry and occupation aspects), and
- household income.

The data collected as described in Section 2.1 indicated the direct significance of the industries utilising the resources of the SDRR. The input-output models were used to estimate the indirect significance (multiplier effects) of these industries.

As well as the impact of the existing utilisation of the resources of the SDRR, the consultation and data gathering process was used to bring together information about likely future levels of utilisation of the resources of the reserve. This information was incorporated into the local and State input-output models to estimate the potential economic impacts of future utilisation of the resources of the SDRR.

2.5. Resource Use Conflicts and the Impact of Development Initiatives

The data collected through the proposed consultation process and as described in 2.1 (4) and (5) enabled the clear identification of resource conflicts in the current and potential future utilisation of the natural resources of the SDRR.

As noted under 2.1 (5), a review of existing literature on resource valuation was undertaken.

This literature review allowed the consultants to provide a broad indication of the value of the natural resources of the reserve. With information about likely future levels of utilisation of the resources of the reserve it was possible to make an assessment of the effect that possible development initiatives will have on the value of the natural resources of the reserve.

2.6. Economic Outlook

There are many external factors that have the potential to impact upon the future level of activities that utilise the resources of the SDRR. To gain an overview of the general economic outlook for the State, a review was made of current position and forecasting papers prepared by both public and private sector agencies (eg *South Australian Economic Indicators* - ABS, monthly; *Trends: A Bulletin of Economic Development in South Australia* - Bank SA, quarterly). In addition, consultation was made with key representatives of Government agencies and industry in the sectors where future development is likely to occur (eg South Australian Tourism Commission, Mines and Energy South Australia).

The review and consultation process outlined above enabled the preparation of an economic outlook which:

- reviewed economic factors external to the reserve that may influence the growth of economic activity and employment for SA
- advised on the macro-economic position
- established growth prospects generally
- provided a general forecast of economic activity and employment for South Australia, and
- related this to the impact on the reserve.

2.7. Reporting Results

This project report was prepared which provides:

- a description of the consultation process and models used
- comments on the strengths and weaknesses of the process and models
- the outcomes of the data collection and analysis, and
- recommendations on data requirements and analytical frameworks for future ten year reviews of Regional Reserves.

The report was provided as a draft to the client for review and comment. This final report was then prepared.

3. SOCIO-ECONOMIC PROFILE OF THE REGION

3.1. Where People Live

Within the SDRR there is no permanent human habitation and even in the surrounding areas the population is sparse. From the Population Census conducted by the ABS in 1996, it is possible to collate information about residents in the districts adjacent to the Regional Reserve.

The smallest geographic unit for which census data are collected is known as a collector's district (CD). There are two CDs relevant to this study, 4010102 and 4010201. For the purpose of this study these are referred to as 'Oodnadatta' and 'Simpson', respectively. The CD of Oodnadatta includes the township of Oodnadatta only. The western side of the Simpson CD follows the Old Ghan Rail Route and the Oodnadatta Track. The western boundary goes all the way from the Northern Territory border to the Dog Fence on the eastern side of the Finnis Springs Aboriginal Lands. The Dog Fence from Finnis Springs to longitude 139° east comprises the southern boundary of the CD. The line from the Dog Fence to the Queensland border along longitude 139° east defines the eastern boundary of the CD and it is bound to the north by the section of the South Australian border from longitude 139° east to the Old Ghan Rail Route.

On Census night, there were almost 400 people resident in the two CDs in aggregate, 154 in Oodnadatta and 230 in the Simpson CD (Table 1). Over two-thirds of the Oodnadatta population is aboriginal, in contrast to the Simpson CD population which is less than 2 per cent aboriginal. A majority of the population was born in Australia with less than 10 per cent in both districts born overseas.

Table 1 Population and Place of Birth

	Oodnadatta			Simpson CD			Total Region		
	Male	Female	Persons	Male	Female	Persons	Male	Female	Persons
Total persons	76	78	154	141	89	230	217	167	384
Aged 15 years and over	53	52	105	126	65	191	179	117	296
Aboriginal	49	52	101	3	0	3	52	52	104
Torres Strait Islander	0	4	4	0	0	0	0	4	4
Both Aboriginal/Torres Strait Islander(b)	0	0	0	0	0	0	0	0	0
Australian born	71	71	142	123	75	198	194	146	340
Born Overseas:									
Canada, Ireland, NZ, RSA, UK(c) & USA	3	0	3	3	6	9	6	6	12
Other country(d)	0	4	4	10	0	10	10	4	14
Total Born Overseas	3	4	7	13	6	19	16	10	26

(a) Overseas visitors are included in these categories. All other categories exclude overseas visitors.
(b) Applicable to persons who are of both Aboriginal and Torres Strait Islander origin.
(c) Comprises England, Scotland, Wales, Nth'n Ireland, Channel Islands, Isle of Man & UK/Ireland n.f.d.
(d) Includes 'inadequately described', 'at sea', and 'not elsewhere classified'.
(e) Includes 'non-verbal so described' and 'inadequately described'.
(f) Applicable to persons aged 15 years and over.
(g) Applicable to persons aged 5 years and over.

The data provided in Table 1 relate to the population resident in the area on Census night. In areas with relatively small populations and large visitor numbers, the Census data can distort the real picture. Table 2 shows that while there were a small number of visitors to Oodnadatta on Census night, around 57 per cent of the population counted in the Simpson CD is usually resident elsewhere in South Australia, interstate or overseas.

Table 2 State of Usual Residence

	Oodnadatta			**Simpson CD**		
	Male	Female	Persons	Male	Female	Persons
Counted at home	69	74	143	51	48	99
Visitors From:						
Same statistical local area	0	0	0	0	0	0
Different statistical local area in:						
New South Wales	0	0	0	17	6	23
Victoria	0	0	0	25	17	42
Queensland	0	0	0	7	5	12
South Australia	4	3	7	34	9	43
Western Australia	3	0	3	0	0	0
Tasmania	0	0	0	3	3	6
Northern Territory	0	0	0	0	0	0
Aust Capital Territory	0	0	0	3	0	3
Other Territories	0	0	0	0	0	0
Total	7	3	10	89	40	129
Overseas visitor	0	0	0	3	0	3
Total	76	77	153	143	88	231

The high number of visitors to the Simpson CD as a proportion of the total population is verified in Table 3 which shows that over 60 per cent of the occupied dwellings on Census night were either caravans, cabins, improvised homes or tents.

Table 3 Number of Occupied Private Dwellings by Dwelling Structure

	Oodnadatta	**Simpson CD**	**Total**
Separate House	30	19	49
Semi-detached, row or terrace house, townhouse etc.	8	0	8
Flat , unit or apartment:	0	0	0
Caravan , cabin, houseboat	3	7	10
Improvised home, tent, sleepers out	3	30	33
House or flat attached to a shop, office, etc.	0	3	3
Not stated	5	0	5
Total	49	59	108

3.2. Demographic Characteristics

In Table 4 the age distribution of the two districts is compared with that of Australia. While the Simpson CD has a slightly older age profile than that of Australia, the age profile of Oodnadatta is much younger. For example, over 80 per cent of the Oodnadatta population was less than 40 years old at the time of the 1996 Population Census, compared to 59 per cent for Australia as a whole.

Table 4 Age Distribution of the Population

	Oodnadatta			**Simpson CD**			**Australia**		
	M	F	Total	M	F	Total	M	F	Total
0-9	11%	12%	23%	3%	7%	9%	7%	7%	14%
10-19	3%	9%	13%	6%	5%	12%	7%	7%	14%
20-29	13%	13%	26%	9%	4%	13%	8%	8%	15%
30-39	7%	12%	19%	15%	4%	19%	8%	8%	16%
40-49	5%	5%	10%	9%	5%	14%	7%	7%	14%
50-59	5%	5%	10%	10%	4%	13%	5%	5%	10%
60-69	0%	0%	0%	6%	8%	14%	4%	4%	8%
70-79	0%	0%	0%	4%	1%	5%	3%	3%	6%
80+	0%	0%	0%	0%	0%	0%	1%	2%	3%
Total (a)	44%	56%	100%	62%	38%	100%	50%	50%	100%

(a) Excludes overseas visitors

The languages spoken at home by the population (over 5 years old) of Oodnadatta and the Simpson region are detailed in Table 5. While almost all (over 90 per cent) of the population in the Simpson CD speak English only, approximately one-third of the Oodnadatta population speaks at least one language other than English at home. Not surprisingly, the main languages are Australian Indigenous languages. Unfortunately, this question was poorly answered in the Census with around 60 per cent of those who speak a language other than English, inadequately described what that language is.

Table 5 Language spoken at Home (persons aged 5 years and over)

	Oodnadatta			**Simpson CD**			**Total Region**		
	Male	Female	Persons	Male	Female	Persons	Male	Female	Persons
Speaks English only	42	44	86	126	76	202	168	120	288
Speaks language other than English									
Australian Indigenous	7	7	14	0	0	0	7	7	14
Asian Languages	0	0	0	0	0	0	0	0	0
Europeans Languages	0	0	0	3	0	3	3	0	3
Arabic	0	0	0	0	0	0	0	0	0
Other (a)	12	11	23	3	0	3	15	11	26
Total other language	19	18	37	6	0	6	25	18	43
Not Stated	3	3	6	5	5	10	8	8	16
Total (b)	64	65	129	137	81	218	201	149	350

(a) Includes 'inadequately described' and 'non-verbal so described'.
(b) Excludes overseas visitors.

In Table 6, the highest level of qualification for persons over 15 years is detailed. In both Oodnadatta and the Simpson CD around 45 per cent of the population over 15 years have some form of qualifications. While the male and female proportions are similar in the Simpson CD, the proportion of females with qualifications in Oodnadatta is almost twice that for males.

Table 6 Highest Level of Qualification, Persons over 15 years with a Qualification

	Oodnadatta			**Simpson CD**			**Total Region**		
	Male	Female	Persons	Male	Female	Persons	Male	Female	Persons
Higher degree	0	0	0	3	0	3	3	0	3
Graduate diploma	3	6	9	0	0	0	3	6	9
Post-bachelor deg.	0	9	9	6	9	15	6	18	24
Under-graduate dip.	3	3	6	6	8	14	9	11	14
Associate diploma	3	0	3	6	0	6	9	0	9
Skilled vocational	3	0	3	29	3	32	32	3	35
Basic vocational	0	3	3	0	0	0	0	3	3
Inadequately described	0	0	0	0	3	3	0	3	3
Not stated	4	9	13	7	7	14	11	16	27
Total pop over 15 yrs with qualification	16	30	46	57	30	87	73	60	133
Total pop over 15yrs	53	52	105	126	65	191	179	117	296
% of population over 15 years with qual.	30%	58%	44%	45%	46%	46%	41%	51%	45%

3.3. Who Provides the Jobs

The summary labour force position for the region is provided in Table 7. All those in the labour force in Oodnadatta had a job at the time of the 1996 Population Census. The labour market position was similarly healthy in the Simpson CD with all females in the labour force employed and only 3 of 102 males unemployed.

Table 7 Summary Labour Force Statistics

	Oodnadatta			**Simpson CD**			**Total Region**		
	Male	Female	Persons	Male	Female	Persons	Male	Female	Persons
Unemployed(f)	0	0	0	3	0	3	3	0	3
Employed(f)	40	38	78	99	38	137	139	76	215
In the labour force(f)	40	38	78	102	38	140	142	76	218
Not in labour force(f)	8	9	17	21	23	44	29	32	61
Unemployment Rate(f)	0%	0%	0%	2.9%	0%	2.1%	2.1%	0.0%	1.4%

See notes to Table 1.

Employment by industry in the region is detailed in Tables 8 and 9. Table 8 provides actual employment numbers and Table 9 shows industry employment in Oodnadatta and the Simpson CD in percentage terms together with the corresponding figures for Australia.

Employment in the Simpson CD is concentrated mainly in pastoral activities (42 per cent of the total) and the building and construction industry[1] (23 per cent). Around 60 per cent of the people in the Simpson CD are not at their usual place of residence (Table 2) and many of the dwellings in the area are of a temporary or portable nature (Table 3). This would suggest that many people recorded in the area on Census night are either tourists or working on short-term construction related projects.

Table 8 Employment by Industry (no. of persons, 1996)

	Oodnadatta			**Simpson CD**			**Total Region**		
	M	F	Total	M	F	Total	M	F	Total
Ag, Forestry & Fishing	0	0	0	33	16	49	33	16	49
Mining	0	0	0	0	0	0	0	0	0
Manufacturing	0	0	0	6	0	6	6	0	6
Elect, Gas and Water	0	0	0	0	0	0	0	0	0
Construction	0	0	0	27	0	27	27	0	27
Wholesale Trade	0	0	0	0	0	0	0	0	0
Retail Trade	0	3	3	0	0	0	0	3	3
Accom, Cafes & Rest	3	6	9	3	3	6	6	9	15
Transport and Storage	0	0	0	6	0	6	6	0	6
Comm Services	0	0	0	0	0	0	0	0	0
Finance and Insurance	0	0	0	0	0	0	0	0	0
Property & Bus Services	0	0	0	12	0	12	12	0	12
Gov Admin & Defence	0	0	0	0	0	0	0	0	0
Education	4	6	10	0	0	0	4	6	10
Health & Com Services	24	18	42	0	6	6	24	24	48
Cult & Recreat Services	0	0	0	3	0	3	3	0	3
Pers & Other Services	3	0	3	0	0	0	3	0	3
Other	6	0	6	0	3	3	6	3	9
TOTAL	40	33	73	90	28	118	130	61	191

1. Ag - Agriculture; Elect - Electricity; Accom - Accommodation; Rest - Restaurants; Comm - Communication; Bus - Business; Gov - Government; Admin - Administration; Com - Community; Cult - Cultural; Recreat - Recreational; Pers - Personal.

2. Rounding errors occur.

[1] The construction industry, as defined by the Australian Bureau of Statistics, includes road construction, quarrying for earth, soil and filling for road and other construction activity, earthmoving, excavation, mine site preparation, removal of overburden and trench digging.

Not surprisingly, employment in Oodnadatta has quite a different industry profile. The largest employment sector is health and community services (58 per cent) followed by education (14 per cent) and accommodation, cafes and restaurants (12 per cent).

Table 9 Employment by Industry in Percentage Terms (1996)

	Oodnadatta			**Simpson CD**			**Australia**		
Sector (a)	M	F	Total	M	F	Total	M	F	Total
Ag, Forestry & Fishing	0%	0%	0%	37%	57%	42%	5%	3%	4%
Mining	0%	0%	0%	0%	0%	0%	2%	0%	1%
Manufacturing	0%	0%	0%	7%	0%	5%	16%	8%	13%
Elect, Gas and Water	0%	0%	0%	0%	0%	0%	1%	0%	1%
Construction	0%	0%	0%	30%	0%	23%	10%	2%	6%
Wholesale Trade	0%	0%	0%	0%	0%	0%	7%	4%	6%
Retail Trade	0%	9%	4%	0%	0%	0%	12%	16%	14%
Accom, Cafes & Rest	8%	18%	12%	3%	11%	5%	4%	6%	5%
Transport and Storage	0%	0%	0%	7%	0%	5%	6%	2%	4%
Comm Services	0%	0%	0%	0%	0%	0%	2%	1%	2%
Finance and Insurance	0%	0%	0%	0%	0%	0%	3%	5%	4%
Property & Bus Services	0%	0%	0%	13%	0%	10%	10%	10%	10%
Gov Admin & Defence	0%	0%	0%	0%	0%	0%	5%	4%	5%
Education	10%	18%	14%	0%	0%	0%	4%	11%	7%
Health & Com Services	60%	55%	58%	0%	21%	5%	4%	17%	9%
Cult & Recreat Services	0%	0%	0%	3%	0%	3%	2%	3%	2%
Pers & Other Services	8%	0%	4%	0%	0%	0%	3%	4%	4%
Other	15%	0%	8%	0%	11%	3%	3%	3%	3%
TOTAL (b)	100%	100%	100%	100%	100%	100%	100%	100%	100%

(a) Ag - Agriculture; Elect - Electricity; Accom - Accommodation; Rest - Restaurants; Comm - Communication; Bus - Business; Gov - Government; Admin - Administration; Com - Community; Cult - Cultural; Recreat - Recreational; Pers - Personal.

(b) Rounding errors occur.

Care needs to be taken when interpreting these types of data for small population districts. First, errors by survey respondents can distort the results to a relatively large degree. Second, in isolated areas most businesses, particularly those in the service industries, provide more than one service and these services are not necessarily in the same industry sector. A roadhouse, for example, may be a restaurant, grocery retailer, post office, accommodation provider, as well a provider of motor vehicle spare parts and repairs.

Household income for the two Collector's Districts is provided in Table 10. The data are presented as the percentage of households in different income categories. In Oodnadatta there is more uniformity of household income earners than in the Simpson CD. For example, 60 per cent of households have income in

the middle three income brackets ($300 - $999) whereas only 38 per cent of Simpson area households fall within this range. The Simpson CD has a higher proportion of both low income (less than $300) and high income ($1000 or more) households than Oodnadatta.

Table 10 Weekly Household Income

	Oodnadatta	**Simpson CD**	**Australia**
Negative/Nil Income	0%	5%	1%
$1 - $119	0%	5%	1%
$120 - $299	11%	15%	18%
$300 - $499	20%	7%	16%
$500 - $699	25%	16%	13%
$700 - $999	16%	15%	16%
$1,000 - $1,499	9%	16%	14%
$1,500 - $1,999	0%	5%	5%
$2,000 or more	0%	5%	5%
Partial income stated (a)	14%	9%	8%
All incomes not stated (b)	5%	0%	3%
Total	100%	100%	100%

(a) Comprises households where at least one, but not all, member(s) aged 15 years and over did not state an income and/or at least one spouse, child or co-tenant was temporarily absent.
(b) Comprises households where no members present stated an income.

4. INDUSTRIES UTILISING THE RESOURCES OF THE RESERVE

The use of the SDRR can be categorised into four broad areas, tourism, conservation, mining and management and research, each of which are briefly described in this section. Clearly the four categories are not independent activities as there are strong interactions between them. Tourism activity is partly dependent on the ecological and cultural amenity of the area. Tourism, conservation and mining activities are all affected by the management of the area and the various on-going research programs.

4.1. Tourism

The first vehicle crossing of the desert was achieved in 1962 by Dr Reg Sprigg of Geosurveys of Australia, who was carrying out preliminary exploratory and technical work for the South Australian and Northern Territory Oil Search Company (SANTOS). In 1964, the French Petroleum Company constructed the 'B line', or 'French Track' as it is commonly known, from near Dalhousie Springs to Poeppel Corner. This provided the first major access route across the Simpson Desert and enabled its opening up for tourism. Continued petroleum exploration work, particularly in the central and southern areas of the desert, created a network of seismic tracks across the desert (Shephard 1992). This network of tracks, in effect, provided the basic infrastructure for recreational access to the desert.

During the 1970s, with increased leisure time, higher disposable incomes, improved vehicle technology and availability (eg easier access to four wheel drive vehicles) and greater exposure to the attractions of the desert (eg through the well publicised crossings by the Leyland Brothers), tourism into the desert started to grow. The first commercial tour group crossing of the desert was undertaken in 1971 when two Land Rovers and an International four wheel drive truck were used to carry a nine person party (Shephard 1992).

Accessibility to the desert has increased further over the past two decades with continued improvements in the four factors mentioned above: leisure time, disposable income, four wheel drive vehicle technology and comfort, and knowledge about and interest in the desert.

Tourism has become a significant activity in the SDRR and the surrounding desert areas, despite the remoteness of the area and inhospitable environment. Indeed, it is these very characteristics that attract visitors to the reserve, which provides an experience of wilderness and a sense of adventure and isolation.

4.2. Conservation

Scientific studies over the past 30 years have shown there is considerable ecological variation in flora, fauna and land systems throughout the Simpson Desert. The desert has become recognised internationally as one of the most outstanding sand dune deserts in the world. In addition to its dune fields, the desert exhibits a diversity of other landforms including fringe water courses, salt lakes, claypans, gibbers and breakaways. These provide habitats for a range of flora and fauna superbly adapted to their desert environment. Following rainfall, the normally dry watercourses bring life to the desert and, together with the salt lakes and claypans, become important ephemeral wetlands (Shephard 1992).

There is much to justify the ecological and cultural importance of the Simpson Desert, as well as its eminence as one of Australia's great wilderness areas. The desert has a conservation value in addition to the benefits derived by visitors to the desert who appreciate its ecological and cultural amenity. The conservation use of the desert and its attendant value to society is significant in its own right.

4.3. Mining

The development and extent of exploration activity in the region has been described in some detail in Resource Management and Planning (1998). There has been no exploration activity in the SDRR since its proclamation.

The mid-1950s saw the beginning of interest in oil and gas exploration in the far north of South Australia. With the formation of the South Australian and Northern Territory Oil Search Company (SANTOS) aerial and ground searches were extended into the desert.

4.4. Management and Research

To enable appropriate utilisation of the SDRR consistent with the legislation (*National Parks and Wildlife Act 1972*) for both commercial and conservation purposes requires on-going management of the reserve. Management of the reserve rests with the Department of Environment, Heritage and Aboriginal Affairs.

As noted in the introduction to this report, the regional reserve mechanism provides for:

- a conservation focus
- conservation management planning and implementation
- security of tenure for lands reserved under the Act, and
- regulation for the management of human activity.

Major objectives for regional reserve management are to establish strategies that successfully integrate the different uses for which the reserve has been proclaimed. In practical terms, management of the reserve involves maintenance of public services, infrastructure and facilities (including roads, signs, emergency search, rescue and medical services and other policing capabilities).

An important dimension associated with the management of the Regional Reserve is the conduct of research into the flora, fauna and land systems of the desert as well as the region's Aboriginal and European history. There is ongoing monitoring and research by DEHAA and individual research projects being undertaken by individuals representing various organisations around the country.

5. ECONOMIC IMPACT OF INDUSTRIES UTILISING THE RESERVE

The brief for this study specified that the economic impact of industries utilising the Regional Reserve be measured using an input-output analysis framework. This implies that expenditures associated with each of the uses of the Regional Reserve need to be estimated. These estimates can then be incorporated into the input-output models to estimate local and state wide economic impacts. A drawback of this approach arises when there are uses of the Regional Reserve (eg, conservation use) for which there are no financial transactions and therefore no quantifiable economic impacts.

5.1. Tourism

The economic impact of tourism on a 'host' economy can be measured through the quantification of expenditure by visitors to the region. In principle, the nature and size of the impacts depend on the needs and wants of the tourist, the structure and size of the local economy and the types of interactions between the tourist and the host economy.

Tourist demand can be represented by demand profiles (expenditure on vehicles, fuel, daily provisions, accommodation, guided tours, etc) while the structure of a region can be represented by an input-output table. Using some classification based on the type of tourist, the total demand for goods and services can be split into demand for specific goods and services by each type of tourist. While for other tourist destinations a range of types of tourists is often relevant (day trippers, visiting friends and relatives, getaway, business, education, etc.), visitors to the Simpson desert are relatively homogeneous in terms of their need or demand for goods and services.

There are two components of expenditure that are relevant for the analysis, expenditure in the region adjacent to the Simpson Desert (Oodnadatta, Mt Dare) and expenditure elsewhere in South Australia that can be attributed to visits to the Simpson Desert.

For many of the people crossing the Simpson Desert, the crossing is not the sole purpose of their trip. Consequently, it is not appropriate to attribute total trip expenditure to the impact of the Desert. It is assumed that, on average, in getting to the Simpson Desert region at least one day's travelling in South Australia (including an overnight stay) would be involved and that the associated expenditure could be attributed to the Simpson Desert.

A majority of visitors to the desert cross from West to East (reportedly up to 90 per cent), and therefore travel in South Australia prior to reaching the Simpson Desert Region. The assumption of one day's travelling in South Australia has also been made for those crossing the Desert from East to West. It is assumed that they spend at least one day, on average, travelling in South Australia prior to reaching their next destination.

5.1.1. Number of Visitors to the Simpson Desert

From discussions with business and tourism facility operators in Oodnadatta, Mt Dare and Birdsville, a profile of tourism expenditure was estimated for visitors to the desert. From similar discussions and other sources an estimate was made of the number of visitors to the desert. Because expenditures have been estimated on a per vehicle basis, the number of vehicles crossing the desert is more relevant for the economic analysis than the actual number of people.

Because no data are collected on the number of vehicles crossing the Simpson Desert, it is necessary to estimate the figure from related information (eg number of Desert Parks passes) and perceptions of those working in the area.

Method 1 – Desert Parks Passes. Table 11 indicates that the number of passes sold in recent years to be around or just under 4000 per annum. To estimate the number of vehicles crossing the Simpson it is necessary to know the proportion of vehicles that enter the State's desert parks without a pass and the proportion of vehicles entering the State's desert parks that visit the Simpson Desert. It was acknowledged by most people interviewed that a proportion of vehicles that enter the Simpson Desert do not have a pass and that the proportion has increased in recent times. The increase has been attributed to the passes no longer being sold at Mt Dare following their availability at Dalhousie Springs. Some of the people who pass through Mt Dare

simply do not stop at Dalhousie Springs while for others the rangers are not present at the time they wish to purchase the passes.

It is assumed that approximately 80 per cent of visitors to desert parks in the state carry a desert parks pass which implies that there are around 5000 vehicles entering the State's desert parks each year. It is further assumed that 60 per cent of visitors to desert parks visit the Simpson Desert. Under these assumptions around 3000 vehicles would cross the desert each year.

Table 11 Number of Desert Parks Passes by Origin of Visitor, 1994-97

	1994		**1995**		**1996**		**1997**	
O/S	5	0%	14	0%	20	0%	24	1%
TAS	17	0%	36	1%	37	1%	38	1%
QLD	418	12%	417	11%	413	10%	449	12%
SA	1111	31%	1010	28%	1121	27%	1049	28%
NSW	895	25%	952	26%	1104	27%	920	25%
NT	40	1%	69	2%	40	1%	34	1%
ACT	46	1%	57	2%	65	2%	56	1%
VIC	1041	29%	1071	29%	1219	30%	1091	29%
WA	54	1%	46	1%	68	2%	74	2%
Total	**3627**	**100%**	**3672**	**100%**	**4087**	**100%**	**3735**	**100%**

Source: DEHAA

Method 2 – Vehicles at Mt Dare. The manager at Mt Dare estimated the following average number of vehicles staying at Mt Dare throughout the year:

Period	Total for Period
April-June: 10 vehicles/day	900
July: 30 vehicles/day	900
August-October: 15 vehicles/day	1350
November-March: 5 vehicles/day	750
Estimated Total for Year	**3900**

The manager further estimated that around 60 per cent of vehicles that stay there go on to cross the Simpson Desert, i.e. around 2340 vehicles per annum. If this represents 80 per cent of vehicles that cross the desert (others either not stopping at Mt Dare or using alternative routes such as crossing from Hamilton through Pedirka to Dalhousie Springs) then the total number of vehicles crossing the desert is around 2900.

Method 3 – Birdsville estimate: Mr. David Brook (Mayor of Diamantina Shire, owner of the Birdsville Roadhouse and part owner of the Birdsville Hotel) estimated approximately 10 000 people cross the Simpson Desert annually and that on average there would be 3 people in each vehicle. This implies over 3300 vehicles crossing the desert each year.

On the basis of the estimates derived by the above three methods, it is assumed, for the purpose of this analysis, that there are approximately 3000 vehicles crossing the desert per annum. Further, as there is likely to be an average of between 2.5 and 3 people per vehicle, the number of people visiting the desert each year is estimated to be around 8000.

5.1.2. Expenditure Profile of Visitors to the Simpson Desert

As with deriving an estimate of visitor numbers, discussions with business and tourism facility operators in Oodnadatta, Mt Dare and Birdsville provided the basis for estimating a profile of tourism expenditure for visitors to the Simpson Desert. These estimates are detailed in Table 12.

The expenditure estimates are presented as expenditure per vehicle and total expenditure. They are provided for both the Simpson Desert region and for South Australia as a whole (including the Simpson Desert region). Visitor expenditure in the Simpson Desert region is estimated to be $220 per vehicle, which in aggregate equates to $660 000 per year (assuming 3000 vehicle crossings per annum). Clearly, expenditure per vehicle by some visitors will be significantly higher than the estimates provided in Table 12, particularly those groups spending more than two or so days in the desert. However, the aim has been to provide an estimate of the expenditure profile of the typical or average visitor.

Table 12 Estimated Expenditure by Simpson Desert Visitors, 1997/98

Expenditure Item	**Simpson Desert Region**		**Total SA(a)**	
	Expenditure per Vehicle ($)	Total Annual Expenditure(b) ($'000)	Expenditure per Vehicle ($)	Total Annual Expenditure(b) ($'000)
Fuel	100	360	160	480
Mechanical repairs	20	60	30	90
Tyres	30	90	35	105
Accommodation	10	30	35	105
Food, grocery items	40	120	60	180
Drinks	10	30	20	60
Souvenirs, film, etc.	10	30	20	60
Total	**220**	**660**	**360**	**1,080**

(a) Expenditure in South Australia (including Simpson Desert region) attributable to visits to the Simpson Desert

(b) Based on 3,000 vehicles per annum.

5.1.3. Economic Impact of Tourism

Table 12 provides the estimated profile of final expenditure by visitors to the Simpson Desert at both the regional and state levels. With appropriate adjustments, these data can be incorporated into regional (Unincorporated Far North) and state input-output tables to derive estimates of the economic impact on the regional and state economies. The estimated impacts are provided in Tables 13 and 14.

The impacts on the local economy are reported in Table 13. Expenditures in the Simpson Desert Region (Oodnadatta – Mt Dare area) were incorporated into the regional input-output table. Expenditures by visitors generate an estimated $840 000 in direct and indirect business turnover. This includes sales direct to visitors of $660 000 (Table 12) plus flow-on business in the region ($220 000) which occurs as a result of the initial sales to visitors.

Table 13 Economic Impact of Simpson Desert Tourism on the Simpson Desert Region Economy (direct plus indirect effects), 1997/98

Sector	**Business Turnover ($'000)**	**Value Added ($'000)**	**Employment (jobs)**	**Household Income ($'000)**
Trade	570	180	5	95
Accom, Hotels	120	50	2	30
Other Sectors	150	80	2	40
Total	**840**	**310**	**9**	**165**

Associated with business turnover is value added. Value added is calculated as the value of output less the cost of goods and services used in producing the output. Value added is consistent with standard measures of economic activity, such as gross domestic product and gross state product, and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity. Expenditure by visitors to the Simpson Desert adds an estimated $310 000 to the regional economy on an annual basis.

There are estimated to be a total of nine jobs generated locally (direct plus indirect) by the economic activity associated with visitors to the Desert. These jobs in turn provided an estimated $165 000 in household income.

The economic impact detailed in Table 13 at the regional level was also estimated at the state level. For two reasons the state level impacts are significantly higher. First, some of the expenditures that occur locally (eg fuel and drinks) are on goods that are imported to the region from elsewhere in the state. While there is a partial impact locally through the retailing of the good, the manufacture of the good and its transport to the region are undertaken by businesses outside the region. Second, as discussed at the beginning of Section 5.1, at least one day's travel in South Australia (including an overnight stay) would be involved, on average, in getting to the Simpson Desert. The associated expenditure could be attributed to tourists visiting the Desert but, clearly, this expenditure will occur within South Australia, outside the local region.

The interpretation of results provided in Table 14 is identical to that for Table 13.

Table 14 Economic Impact of Simpson Desert Tourism on the South Australian Economy (direct plus indirect effects), 1997/98

	Business Turnover ($'000)	Value Added ($'000)	Employment (jobs)	Household Income ($'000)
Trade	920	330	8	170
Accom, Hotels	210	100	5	70
Other Sectors	890	430	6	180
Total	**2020**	**860**	**19**	**420**

5.2. Conservation

The economic value of the SDRR, derived from its environmental amenities, comprises explicit use benefits as well as implicit non-use benefits. Use benefits are those that accrue from the physical use of the Regional Reserve, such as touring, camping and adventure treks. The implicit non-use values are more aligned with conservation and environmental preservation.

The conservation use of the SDRR is, to some extent, associated with the demand for tourism in the area. While some people may travel to the desert areas for the simple four wheel drive adventure, it could be argued that it is the environmental qualities of the desert landscape, the night sky and an area unsullied by human habitation that attracts visitors to this remote region.

To this extent, the economic impact of conservation is included in the economic impact of tourism (Section 5.1). There are additional activities directly related to the conservation of the environment of the Regional Reserve that have a measurable impact on the economy. These include the production of documentaries, books and photographs on and about the reserve which generates greater knowledge of the reserve and an interest in the preservation of that area. Expenditure on research expeditions to the area, and on the management of the reserve necessary to ensure that the conservation values are protected, adds to this economic impact. The economic impact of management of the Regional Reserve and research activity in the area is discussed in Section 5.4.

The economic value of the SDRR, however, is greater than that implied by demand for tourism in the area and expenditures on management and research. In a market economy, issues of valuation and choice between conflicting uses are normally resolved by the interaction of consumers and producers trading goods in the market place. This means that the value of petroleum mining, for example, can be based on the market price of the good that is produced and the wealth that it generates in the economy. However, determining comparable values of non-market uses, such as conservation (including the value of the harmful consequences on these uses from mining activity) is more difficult.

These types of 'goods', which obviously have a value to society, are not traded in the market place and so do not have an obvious price. They have economic meaning because any thing or action from which individuals gain satisfaction is deemed to be of value. However, because there is no price attached to the 'goods', there are no financial transactions incurred in the 'consumption' of those goods and hence there is no economic impact that can be measured.

5.3. Petroleum and Mining

As there is currently no petroleum exploration or mining activity in the Regional Reserve, there is no economic impact that can be measured.

5.4. Management and Research

Although management and research may facilitate current and future utilisation of the resources of the Regional Reserve, the direct economic impacts of management and research arise from the expenditures incurred in undertaking these activities.

As well as expenditure on research there are also associated expenditures on the maintenance of public services, infrastructure and facilities (including roads, signs, emergency search, rescue and medical services and other policing capabilities).

Information was sought from various sources on these different categorises of expenditure. Generally, the data could only be provided as an estimate as expenditure has not been recorded in a way consistent with the boundaries of the Regional Reserve.

Table 15 Management and Research Activity in the Simpson Desert Regional Reserve

Activity	Source	Notes
Cost of management of the Simpson Desert Regional Reserve	John Watkins, DEHAA	Proportion of costs attributable to the Regional Reserve increase gradually from $20 000 in 1988 to $40 000 in 1997 but jumped to an estimated $80 000 in the current year
Direct material cost of specific projects (track marking, Simpson Desert clean up, etc.)	Pearce Dougherty, DEHAA; Friends of the Simpson Desert	Direct expenditure has generally been less than $4000/annum. Significant in-kind/ non-cash contributions have been made by the FOS group.
Expenditure for the Insurance risk Management Fund	Maureen Skinner, DEHAA	Over the four years to June 1998 approximately $220 000 spent on Witjira NP/Simpson Desert. Most of the expenditure has been for flood damage at Witjira. None could be directly attributable to the Regional Reserve.
Research Activity	Mark Wilson DEHAA; Luise Hercus, ANU	Biological Survey and Mulgara research - $107 000. Other significant project in past 10 years an ARC grant for approximately $30 000 – about 1/3 attributable to the Regional Reserve.

Based on the information presented in Table 15, it was estimated that current year expenditure on management and research activity in the SDRR would sum to approximately $100 000. As only a small amount of this expenditure is incurred in the region, the impacts have been calculated at the state level only. The results are reported in Table 16.

Expenditure of $100 000 by the Public Administration sector generates significant flow-ons to other sectors in the economy. Direct and indirect value added sums to $120 000, there is the equivalent of two jobs created and approximately $80 000 in household income.

Table 16 Economic Impact of Regional Reserve Management and Research on the South Australian Economy (direct plus indirect effects), 1997/98

	Business Turnover ($'000)	Value Added ($'000)	Employment (jobs)	Household Income ($'000)
Public Admin	115	50	1	45
Other Sectors	135	70	1	35
Total	**250**	**120**	**2**	**80**

5.5. Aggregate Economic Impact of Industries Utilising the Resources of the Regional Reserve

As noted in the sections above, it is the tourism and management and research activities only that are currently generating quantifiable economic impacts. These estimated impacts are summarised in Table 17, where impacts at the local level and the rest of the state are specified for each of the four economic indicators, these being business turnover, value added (gross state product), employment and household income.

Table 17 Estimated Economic Impact of Activities Utilising the Resources of the Simpson Desert Regional Reserve (direct plus indirect effects), 1997/98

	Business Turnover ($'000)	Value Added ($'000)	Employment (jobs)	Household Income ($'000)
Simpson Desert region (SA)	840	310	9	165
Elsewhere in SA	1430	670	12	335
Total SA	**2270**	**980**	**21**	**500**

Annual Gross State Product (GSP) in South Australia is currently more than $35 billion. Based on the data in Table 17, the SDRR contributes approximately 0.003 per cent of GSP.

Although the impacts are not large in absolute terms, it is worth noting that in the Simpson Desert region (the CDs of Oodnadatta and Simpson Desert) the employment generated (nine jobs) comprises almost 5 per cent of total regional employment (see Table 8).

As well, there are significant impacts felt in Birdsville, which have not been included in the above estimates. Because the majority of the visitor traffic is flowing west to east across the desert, Birdsville is the first destination of visitors upon leaving the desert. The majority of these visitors stay in Birdsville for one or two nights and are reported to have a relatively high propensity to spend compared (particularly on fuel, drinks and souvenirs) to other visitors to Birdsville who arrive via other routes (D. Brook pers comm).

6. RESOURCE USE CONFLICTS AND THE IMPACT OF DEVELOPMENT INITIATIVES

There are currently no significant resource use conflicts in the SDRR. There is a relatively minor threat to the conservation values of the reserve resulting from the increasing use of the reserve for adventure tourism. However, use of the Regional Reserve by tourists is restricted to the area 500 metres either side of the access roads. This equates to approximately 460km^2, only 1.5% of the total area of the Regional Reserve.

The areas of potential future conflict can be summarised as follows:

- Petroleum, mining and tourism - this conflict is likely to arise only to the extent that demand for tourism in the area is linked to the conservation value of the regional reserve (see 'mining and conservation' below). Other aspects of mining industry activity, particularly road building and maintenance, are likely to be complementary to rather conflicting with tourism activity.
- Petroleum, mining and conservation – because there has been little or no mining and exploration activity in the area over the past 10 years there has been no conflict between mining and other use of the Regional Reserve. Although there is potential for future mining industry activity in the Regional Reserve, it will almost certainly be restricted to geographic areas extremely small in size relative to the total area of the Regional Reserve. For this reason future mining industry activity is likely to detract little from the conservation value of the Regional Reserve.
- Tourism and conservation – as noted above there may be a threat to conservation values resulting from the increasing use of the Regional Reserve for adventure tourism. There does exist the possibility for future conflict between tourism and conservation as vehicle accessibility to the Regional Reserve improves and as the demand for the desert wilderness experience increases. The South Australian Tourism Commission has identified the attributes of 'unspoilt nature', 'heritage and culture' and 'accessibility' as three of the four key strengths of tourism that this State has to offer. Areas like the SDRR are likely to be promoted as tourism destinations that offer these attractions. However, the results of this type of promotion could conflict with the attribute of 'unspoilt nature' if access and tourism behaviour are not properly managed.
- Other likely conflict areas relate to tourism and the 'heritage and custom' attribute of the reserve. Currently, the SDRR is subject to two separate and overlapping Native Title claims. If either one or both of these claims are successful, tourism access through the Regional Reserve and surrounding areas could be affected.

It has been beyond the scope and resources of this study to determine the full economic value of the conservation attributes of the Regional Reserve. While the measurement of tourism and mining use values are relatively straightforward, the estimation of conservation values is more problematic. Nevertheless, it is important to keep in mind the possible need to include such assessments in future reviews of the SDRR. This is particularly so should tourism increase to such an extent that the conservation values of the reserve are compromised, or if alternative industries, such as petroleum mining, are developed in the region which conflict with current uses of the reserve. The issues of future assessment are taken up in Section 8.

7. ECONOMIC OUTLOOK

Recent economic indicators for South Australia (*South Australian Economic Indicators* - ABS; *Trends: A Bulletin of Economic Development in South Australia* - Bank SA) reveal continuing growth in the State's economy, as measured by output and final demand. The growth in final demand through the year to the March quarter 1998 was 4.9 per cent, approximately the same as the national rate of 4.8 per cent. Over the last decade, South Australian output has risen by an average of about 1.0 per cent per annum, significantly below the national average. However, the local economy is currently enjoying growth, fuelled by an increase in private consumption expenditure, of around 5.2 per cent over the last year reflected in improvements in retail trade and motor vehicle registrations.

However, the short- to medium-term outlook for the State and National economies is not as bright. As reported in the Reserve Bank Bulletin (August 1998), growth in output of the Australian economy is now slowing from the solid pace recorded during 1997 and into the early part of 1998. There have been a number of signs that the economy is easing back to a more moderate pace of growth. According to the national accounts, there was a sharp slowing in private spending in the March quarter (despite the increase in South Australia), while an unusually large volume of output was absorbed by stockbuilding. The major dampening influence on growth has been the turnaround in the external sector, evident in weakening export volumes and declining commodity prices. The deteriorating external influence, set to continue with the downturn in Japan, has also had an adverse impact on business and consumer confidence. The Australian economy is likely to experience a period of below-trend growth while these factors remain in place.

These general macroeconomic conditions are likely to have an influence on the economic activity associated with the resources of the SDRR. As well there are industry and sector specific issues that are also likely to influence future utilisation of the resources of the reserve. In Sections 7.1 to 7.3 these issues are discussed in turn for tourism, conservation and mining industry uses of the SDRR.

7.1. Tourism

The 1992 Arthur D. Little Economic Development Strategy Study highlighted the importance of tourism to South Australia. The report stated: 'The tourism industry in South Australia is a major contributor to the economy – in terms of dollars spent by tourists, the exports that expenditure represents and the jobs that it creates. As such, it deserves a central place in the State's future economic development strategy'.

The tourism industry in South Australia, however, is dependent on the growth and development of the State's economy, of the National economy and the economic activity of overseas countries. As noted above, recent strong growth in the national and state economies is set to decline over the medium-term.

Expenditure on recreation is closely linked to income levels, with an estimated 30 per cent of the recreation budget spent on holidays. Wages have continued their steady growth, rising 3.9 per cent nationally and 2.7 per cent locally in the last year. Tourism accommodation figures show an improvement in room occupancy rates for South Australia (from 57.1 per cent to 59.2 per cent) which is, for the first time for many years, greater than the national average.

The issues of employment and job security remain strong influences over domestic tourism growth prospects. As well, the South Australian tourism industry is responsive to changes in the Victorian and New South Wales economies, with these two states being the major source of interstate visitors to South Australia.

The medium-term outlook for the recreational services sector is likely to be volatile with major influences coming from the decline in Asian tourism as a result of the economic crisis in that region, the recent decline in the value of the Australian dollar, and the forthcoming Sydney Olympics.

The South Australian Tourism Commission, in their 1998/99 Marketing Plan, believes that the Asian impact on tourism in South Australia is likely to be relatively light due to the low proportion of Asian visitors to this State. They will be targeting Europe and the United States where the affordability of Australia as a destination will increase due to the relatively low value of the Australian dollar.

As noted in Section 4.1, there are a few key factors that will lead to increased demand for desert travel. These include:

- greater leisure time
- improving disposable income
- advances in four wheel drive vehicle technology and comfort
- improving infrastructure and vehicular access to the Region
- increases associated with technology such as GPS and satellite telephones, and
- increasing knowledge about and interest in the desert.

The first two factors, at least, are likely to be directly influenced by the prevailing economic conditions in South Australia and the nation as a whole, while the latter three factors may be affected indirectly by the general economic climate. Certainly, visitor numbers to the Simpson Desert have been increasing by around 10 per cent per annum in recent years, as evidenced by the growth in Desert Parks Passes and verified by managers of businesses operating in the area.

If the growth rate in visitor numbers were maintained, the number of vehicles crossing the desert would approximately double to around 6000 by 2005. The probability of this eventuating will increase greatly if an access road from Cowarie is completed. This would provide an alternative 'loop' or 'circuit' for visitors, would enable access to different desert landscapes and would thereby add to the attraction of the region.

If visitor numbers to the SDRR increase significantly, the preservation and management of the conservation and environmental values of the Region will require greater institutional/regulatory constraints. Successful native title claims on the area are likely to add to the regulatory and management requirements and could dampen tourism demand.

7.2. Conservation

Increased awareness of desert flora and fauna and the unique dunal system of the Simpson Desert, together with a world wide trend of increasing natural areas lost or degraded through economic development and growth, means there will be an increasing demand for the conservation amenities of areas such as the SDRR. While the demand for conservation amenities will be reflected partly in the tourism activity to the reserve, the conservation value will also manifest as non-use benefits, as described in Section 5. These are the benefits individuals may obtain from environmental resources without directly using or visiting them. They are normally classified into five types (Commonwealth of Australia, 1995):

1. Existence values – the welfare obtained from the knowledge than an environmental resource exists. The concept may also include the benefits obtained from knowing culturally important resources are protected.
2. Vicarious values – the welfare obtained from the indirect consumption of an environmental resource through books and other media.
3. Option value – the welfare obtained by retaining the option to use an environmental resource at some future date. Option value stems from the combination of the individual's uncertainty about future demand for the resource and uncertainty about its future availability.
4. Quasi-option value – the welfare obtained from the opportunity to get better information by delaying a decision that may result in irreversible environmental loss. This kind of value may be obtained when future technologies or knowledge enhance the value of the natural resource.
5. Bequest value – the welfare that the current generation obtains from preserving the environment for future generations.

Each of these values are relevant for the SDRR, and not only apply to the demand for conservation, but some (eg options values) could apply to other development initiatives such as petroleum exploration and mining.

7.3. Petroleum

Some analysis has been conducted by PIRSA to estimate the undiscovered petroleum resources of the western Eromanga Basin in South Australia, an area that includes the SDRR. As the basin is oil prone, the analysis conducted by PIRSA has calculated undiscovered oil resources only. Gas discoveries are also possible, but it is unlikely that small gas discoveries in the area would be economic (Morton 1996).

Estimates of undiscovered resources have been carried out by a method that uses available geological data and Monte Carlo type statistical techniques to calculate, as a probability distribution, the undiscovered resources. The results indicated that in the area of the SDRR the likelihood of recoverable oil could be described as follows (J. Morton, pers comm, 1998):

- 90 per cent chance of more than 8.9 million barrels
- 50 per cent chance of more than 14.5 million barrels, and
- 10 per cent chance of more than 23.0 million barrels.

The current world oil price of around US$12 per barrel and an exchange rate of US$0.60 to AU$1.00 gives an Australian equivalent of approximately $20.00 per barrel. At this price the undiscovered resources can be assigned a nominal value at each probability point:

- 90 per cent chance of more than $178 million
- 50 per cent chance of more than $290 million, and
- 10 per cent chance of more than $460 million.

The realisation of potential reserves depends on the economic viability of the resource. This is determined by a combination of many factors, including:

- World consumption: demand for oil is strongly influenced by world economic growth and seasonal factors such as the severity of the Northern Hemisphere winter. With economic contraction in Japan, other parts of Asia and Russia, oil consumption growth will be limited in the short to medium term.
- World production: for many years technological improvements have opened up new fields for exploration and development (ABARE 1998). This trend together with the difficulty oil producing nations (OPEC and non-OPEC) have in adhering to 'agreed' production cuts.
- World price: in principle, the interaction of demand and supply will determine the prevailing world price. In the September quarter 1998, the average trade weighted price of oil fell below US$12. After allowance is made for inflation, average price in the December quarter is forecast by ABARE (1998) to be the lowest since 1973.
- Well drilling success rate: wells cost approximately $1 million to drill (R. Langley, pers comm, 1998) and a poor success rate will quickly deem a potential reserve uneconomic.
- Cost of transport from well head to refinery: the cost of road transport from the SDRR is currently estimated to be between AU$10 and AU$12 per barrel. An alternative to road transportation would be the construction of a pipeline linking up with the existing Moomba to Port Bonython line
- Regulatory environment – there are several considerations that could come into play including environmental and native title issues. As noted earlier, potential license blocks in the SDRR are located in areas currently subject to Native Title claims. The outcome of these claims and subsequent negotiations could affect both access to the resource and the viability of its extraction.

Morton (1996) emphasises that undiscovered resources should not be compared to traditional proved, probable and possible reserves in known discoveries. Undiscovered resources are calculated to give a quantitative indication of the potential of the basin, and require considerable exploration to establish their existence. Consequently, the probability estimates of recoverable oil and its gross value should be treated with great caution and only indicative at best.

8. RECOMMENDATIONS ON DATA REQUIREMENTS AND ANALYTICAL FRAMEWORKS FOR FUTURE TEN-YEAR REVIEWS OF REGIONAL RESERVES

8.1. Data Requirements

8.1.1. Tourism

Some of the basic information that needs to be collected on a regular basis includes:

- visitor numbers
- length of stay
- expenditure profile
- origin and destination
- purpose of trip, and
- demand for infrastructure/facilities.

8.1.2. Conservation

Collecting data on the conservation values of the Simpson Desert is a far more difficult task. Clearly, any such work should be conducted in conjunction with monitoring and assessment of desert's conservation status.

Evaluation studies involving the assignment of values to non-market goods and services are notoriously difficult and time consuming. With an on-going world-wide decline in areas of wilderness, wilderness areas such as the Simpson Desert will become increasingly valuable because of its scarcity value.

Because any significant future resource use conflict in the SDRR is likely to involve the conservation value of the area, it is important that resources be devoted to proper assessment of conservation values.

8.1.3. Petroleum

Monitoring of petoleum activity should be done in conjunction with PIRSA. Data required include:

- Production and value of production
- Expenditure on exploration
- Likely timeframes for future exploration, and
- Likely timeframes for future resource extraction.

8.1.4. Management and Research

There is currently no management plan in place for the SDRR and this would seem to be a fundamental requirement for efficient and effective management of the Regional Reserve. Flowing from the development of a management plan would be the development of systems to provide the necessary information about the resources being used to manage the reserve. The type of information likely to be required would relate to:

- Share of administration costs
- Specific projects
- Research activity, and
- Rescue, policing.

8.2. Analytical Framework for Future Ten-Year Reviews

8.2.1. Preferred Analytical Framework

Current legislation requires that economic assessment of the Regional Reserves provide a statement of the economic impact of utilisation of the resources of the reserve. Although this is of intrinsic interest, it only tells part of the story.

In particular, an assessment framework is needed that has direct application to the management decision making environment. Such a framework would enable the comparison of costs and benefits (to society) of alternative management scenarios, ie existing management regime against possible alternatives. As described in Section 8.2.2, it is important to include environmental valuation in the analytical framework.

The analytical framework would require the following types of outcomes:

- The current economic contribution to the State of the regional reserve under current management arrangements. This information could be provided in terms of the type of economic indicators presented in this review, although careful identification of the costs and benefits of each activity would be needed.
- The future economic contribution to the State of the regional reserve under current management arrangements. Forecasts of future utilisation of the regional reserve could be made to give a profile of activity over a certain number of years (say 10 or 20) under current management arrangements.
- The future economic contribution to the State of the regional reserve under alternative management arrangements. A time profile of activity over a certain number of years (say 10 or 20) under alternative management arrangements could be estimated and then comparisons made with the current arrangements.

8.2.2. Importance of Recognising Environmental Values

To measure the economic impact of an industry utilising the Regional Reserve, it is necessary to quantify the changes in the financial wealth and employment that the resource use generates in the economy. However, it is also important to account for changes in environmental qualities that constitute part of the wealth enjoyed by a community.

In many instances, this value may only become apparent when the environmental qualities are lost or degraded. Air or water pollution for example, could impose large costs on society in financial terms due to health costs and avoidance costs. Human activities ultimately depend to a certain extent on the environment and this includes the production of market goods and services encountered in everyday life. The economic consequences of changes in environmental qualities are usually very complex and difficult to measure.

Where there are conflicting uses of the resources of the Regional Reserve, such as mining, tourism or conservation, it is important to measure the relative values that these uses derive for society. Despite the difficulties in quantifying environmental and tourism benefits, there are methods that are used to estimate and express these in monetary terms so that they can be used in decision making. Such values can be revealed by an individual's willingness to pay to obtain those goods and services, or willingness to accept compensation for the loss of goods and services. There are a number of well developed techniques that estimate society's willingness to pay for some environmental benefit and are described in various publications, including Commonwealth of Australia (1995) and Smith (1996). A number of examples and references of such techniques being applied in valuing Australian natural areas are cited in NSW Environment Protection Authority (1995).

An example pertinent to the SDRR is described in Delforce et al (1986) in which the economic values of two conflicting land uses of the Flinders Ranges in South Australia were measured and compared. The tourism value of the area was measured in terms of actual expenditure and a willingness to pay for access through some of the pastoral leases. This was compared to the perceived production losses and other costs due to tourism to identify the socially optimum policy for the area. It was concluded that greater control over tourism through the pastoral leases was economically desirable.

The need to determine economic values of the environmental amenities and the conservation benefits of the SDRR only arises if there are conflicting uses of the region and decisions have to be made on who should use the environmental resources, and how, where and when they are to be used.

If the effects of human activity on the natural environment are ignored and the values that people place on conservation and such uses are overlooked, then there is a danger that decisions regarding the allocation and use of the resource will not be in the best interest of society.

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Attachment 1 Regional Input-Output Table

1. Overview of Input-Output Analysis

Input-output analysis provides a comprehensive economic framework extremely useful in the resource planning process. Broadly, there are two ways in which the input-output method can be used.

First, the input-output table provides a numerical picture of the size and shape of the economy and its essential features. The input-output transactions table can be used to describe some of the important features of an economy, the interrelationships between sectors, and the relative importance of the individual sectors.

Second, input-output analysis provides a standard approach for the estimation of the economic impact of a particular activity. The input-output model is used to calculate industry multipliers that can then be applied to various development scenarios.

2. Model Development

The input-output table for the Unincorporated Far North was constructed using the GRIT (Generation of Regional Input-output Tables) method supplemented by data gathered from a variety of other sources. A research group at the University of Queensland developed the so-called GRIT method, appropriately termed a 'hybrid' method which utilises local data and computer methods to generate tables. It allows the analyst to exercise judgement as to how much 'hard' data are needed to construct a suitable table. In addition, analysts can focus resources on the important elements or sectors of the economy. This method has come to dominate the construction of regional input-output tables in Australia. An input-output table had already been constructed by EconSearch for the State of South Australia and was made available for this study.

The preliminary Far North table was developed applying the GRIT procedure and subsequently refined applying various adjustment procedures. The computer program to make these adjustments is 'Input-Output Analysis Version 7.1', developed by West (1993). This software was also used to calculate industry multipliers and estimate the impacts of the various SDRR activities at the regional level.

As noted earlier, data for the model were collected from existing sources such as Australian Bureau of Statistics, PIRSA, ABARE, DEHAA, industry reports, industry associations, etc.

The input-output model provides a consistent base to present the available economic data for the Region and allow the significance of activities utilising the resources of the SDRR to be compared with each other and with other sectors in the Regional economy.

2.1 Linkages Between Sectors

The standard approach for the estimation of the regional economic impact of a particular activity, such as agriculture, is to employ *input-output analysis*. The input-output model conceives the economy of the region as being divided up into a number of sectors, and this allows the analyst to trace expenditure flows. To illustrate this, consider the example of a large dairy farm which, in the course of its operation, purchases goods and services (such as fertiliser, feedstuffs, animal health products, building requisites) from other sectors and employs its own labour force. The direct employment created is regarded in the model as an expenditure flow into the household sector, which is one of several non-industrial sectors recognised in the input-output model.

Upon receiving expenditure by the dairy, the other sectors in the regional economy engage in their own expenditures. For example, as a consequence of winning a contract for work at a dairy, a local construction company buys materials from its suppliers, and labour from its own employees. Suppliers and employees in turn engage in further expenditure, and so on. These *indirect effects*, as they are called, are part of the impact of the dairy on the regional economy. They must be added to the *direct effects* (which are expenditures made in immediate support of the dairy activity itself) in order to arrive at a measure of the total impact of the irrigated dairy development.

Unfortunately, these indirect effects do not go on indefinitely due to the presence of *leakages*. In the context of the impact on a *regional* economy, often that of a relatively small region, an important leakage is expenditure on imports, that is, that originate from *outside the local region.*

Thus some of the local expenditure for imports to the local region is lost to the local economy. Consequently, the indirect effects get smaller and smaller in successive expenditure rounds, due to this and other leakages. Hence the total expenditure created in the local economy is limited in amount, and so (in principle) it can be measured.

The performance of the input-output analysis calculations requires a great deal of information. The analyst needs to know the magnitude of irrigated agriculture expenditures and where they occur. Also needed is information on how the sectors that receive this expenditure share *their* expenditures among the various sectors from whom they buy, and so on for the further expenditure rounds.

In applying the input-output model, the standard procedure is to determine the direct or first-round expenditures only. No attempt is made to pursue such inquiries on expenditure in subsequent rounds, not even (for example) to trace the effects in the local economy on household expenditures by dairy farm employees on food, clothing, entertainment, and so on. It is impracticable to measure these effects for an individual case, here the dairy enterprise.

The input-output model is instead based on a set of assumptions about constant and uniform proportions of expenditure. If households in general in the local economy spend (say) 13.3 per cent of their income on food and non-alcoholic beverages, it is assumed that those working in the dairy industry do likewise. Indeed, the effects of all expenditure rounds after the first are calculated by using such standard proportions (*multiplier* calculations).

2.2 Multipliers

Multipliers are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. As well, they can be used to estimate the impact of a change in that particular sector on the rest of the economy. As noted above, detailed explanations on calculating input-output multipliers (and the underlying assumptions) are provided in any regional economics or input-output analysis text book (see for example Hewings (1985), Jensen and West (1986), Midmore and Harrison-Mayfield (1996), Powell et al. (1985), and West (1993)). Suffice to note that they are calculated through a routine set of mathematical operations based on coefficients derived from the input-output transactions table.

2.3 Input-output Transactions Table

The structure and linkages of a local economy can be described with the aid of input-output analysis. Input-output analysis as an accounting system of inter-industry transactions, is based on the notion that no industry exists in isolation.

This assumes within any economy each firm depends on the existence of other firms to purchase inputs from, or sell products to for further processing. The firms also depend on final consumers of the product and labour inputs to production. An input-output transaction table is a convenient way to illustrate the purchases and sales of goods and services taking place in an economy at a given time.

The input-output table for the Unincorporated Far North provides a numerical picture of the size and shape of the economy and its essential features. Products produced in the economy are aggregated into a number of groups of industries and the transactions between them recorded in the transactions table. The rows and columns of the input-output table can be interpreted in the following way:

- The rows of the input-output table illustrate sales for intermediate usage (to other firms) and for final demand (consumers, exports, capital formation).
- The columns show the origin of the inputs and hence the purchases made at that time (labour, capital and intermediate inputs).

- Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

In summary, the input-output transactions table can be used to describe some of the important features of a regional economy, the interrelationships between sectors, and the relative importance of the individual sectors. The table is also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the local economy.

Appendix N Interpretation of Provisions of Section 34A of the Act

In undertaking the review, it has been necessary to ensure that the requirements of the Act are properly addressed. To facilitate this process, an interpretative analysis of section 34A was conducted and is provided below. This analysis has been used to guide the conduct of the review. It is also useful in guiding readers of the report.

For the purposes of section 34A (5)(a)(i) and (ii), *natural resources* are considered to be:

- petroleum and any mineralisation that require the process of recovery to be undertaken by operations that take place within the boundaries of the reserve
- native vegetation which is utilised by pastoral stock for feed
- landscapes and natural features including native vegetation, native animals, birds, insects and other small fauna that are of recreational and educational value to visitors to the reserve and which are accessible to visitors in accordance with the management plan for the park, and
- surface and sub surface water recovered from within the boundaries of the reserve.

For the purposes of section 34A (5)(a)(i) and (ii), *utilisation of natural resources* is taken to mean:

- recovery (petroleum), mining, grazing (pastoralism), environmental appreciation and recreation activity (tourism) and water recovery and use (general) and includes the infrastructure necessary to facilitate such utilisation, and
- recovery and utilisation of water prior to its inflow to the reserve,

where such utilisation is consistent with the specific objective in the Act in relation to the management of regional reserves, that is to say 'permit the utilisation of natural resources while conserving wildlife and the natural and historic features of the land' (section 37j).

For the purposes of section 34A (5)(a)(i), i.e. in the context of conservation, *impact of utilisation* is taken to mean:

- the affects upon the condition of the wildlife and natural features of the reserve and the management strategies that are considered necessary and adequate to sustainably conserve the wildlife and natural features of the reserve, and
- the affect upon the approach taken to managing the wildlife and natural features of the reserve as a response to a regime that provides for land uses other than those characteristic of other classifications of reserve under the Act.

For the purposes of section 34A (5)(a)(ii), i.e. in the context of the economy of the State, *impact of utilisation* is taken to mean:

- the contribution of utilisation to the economy of the State in dollar terms, and
- any offsets to benefits that might be occasioned by one form of utilisation as a result of another.

For the purposes of section 34A (5)(a)(iii), *the future status under this Act of the land constituting the reserve* is taken to mean the classification of the reserve under Part 3, Divisions 1 - 4 and 4A of the Act, the classifications available being National Park (Division 1), Conservation Park (Division 2), Game Reserve (Division 3), Recreation Park (Division 4) and Regional Reserve (Division 4A).

Further, for the purposes of section 34A (5)(a)(iii), *recommendations as to the future status of the reserve* are taken to relate to recommendations made in consideration of:

- the original intent of the reserve classification in providing for the management of the reserve for the purposes of conserving wildlife and natural features and utilising natural resources, and
- any factors that as a result of the review, significantly appear to work against the purpose of the Regional Reserve classification in providing direction for, and facilitating the management of, the reserve.

While the Act, at section 34A, does not provide for the framing of recommendations regarding the ongoing management of the reserve, section 38 of the Act does provide for the preparation and periodic review of reserve management plans.

During the conduct of the review, issues emerged that will need to be addressed in the ongoing management of the reserve. Some of these issues relate to the scope and quality of baseline data upon which critical analysis of management should rely and which will be essential for the conduct of future section 34A reviews. Other issues relate directly to the standards and aspects of management that need to be addressed on an ongoing basis.

Recommendations for management, therefore, while not a requirement in the context of the section 34A report, are nonetheless included in this report for the purposes of foreshadowing those issues that will be need to be addressed in reviewing the plan of management for this reserve.