Halpern
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Maunsell

Consulting Engineers and
Environmental Scientists

HGM

Broome International Airport Holdings

Relocation of Broome International Airport

Public Environmental Review

Invitation

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

In accordance with the requirements of the *Environmental Protection Act 1986*, a Public Environmental Review (PER) has been prepared which describes the proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from **17th April 2000** closing **17th May 2000**.

Comments from the public and government agencies will assist the EPA to prepare an assessment report in which it will make recommendations to the government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal. All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless specifically marked confidential, and may be quoted in full, or in part, in each report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific proposals in the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable; and
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering; and
- attach any factual information that you wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- your address;
- date; and
- whether you want your submission to be confidential.

The closing date for submissions is **17th May 2000**.

Submissions should be addressed to:

The Chairman
Environmental Protection Authority
9th Floor, Westralia Square
141 St George's Tce
PERTH WA 6000

Attention: Ms Marie Ward

Broome International Airport Holdings
Relocation of Broome International Airport

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Executive Summary

Broome International Airport Holdings (BIAH) is the proponent for the proposal to relocate Broome Airport from its current location in the town to a new site approximately 12 km north east of town. The primary requirement for this relocation is to enable the timely development of the Broome township to the north of the airport including developing the airport land itself. Currently, the take-off paths from the existing airport site are over Cable Beach on the western end and Chinatown on the eastern end. The effect on residents is not excessive and in fact, is considered to be novel. However, as the town grows and the frequency of air traffic increases, it is likely that this novelty factor will become a nuisance. The current design capacity of the existing airport will also soon prove limiting in respect of aircraft volumes and types servicing the region.

It is anticipated that the current Broome Airport site will have sufficient capacity to cope with aviation demand for the short term future (5-7 years). There is stress however, on both the available areas for aircraft parking and the use of larger aircraft for inbound tourism to Broome and the Kimberley. Broome International Airport is now the second largest Regular Public Transport airport in Western Australia after Perth Airport and has achieved a growth rate over the last decade of 250%.

There have been a number of taskforces formed in recent years to advance the planning and site selection for a new site to cater for the relocation of the airport and its required increase in future capacity. These have evaluated ten potential locations as part of wider land use planning and extensive public consultation exercises. A preferred site has now been identified situated within the southern section of Water Reserve 25716, some 12 km from the Broome town site.

The Broome Airport Relocation Taskforce (BART) has reached its goal of selecting the site and has now been replaced with the Broome Airport Relocation Implementation Committee (BARIC). BARIC was convened to finalise all processes necessary to allow for the transfer of land for the preferred site from Vacant Crown Land to Broome International Airport Holdings on a conditional lease basis and finally as a freehold site once the airport is operational.

Included in BARIC's task is the finalisation of any environmental approvals that are needed due to the relocation of the international airport from its current location to the southern site. The proposal to relocate the Broome Airport was referred to the Environmental Protection Authority (EPA) in September 1999. The EPA determined that the proposal would be assessed at the level of a Public Environmental Review (PER) and, after resolution of appeals, that it would be made available for public comment for a 4 week period.

The EPA identified a range of factors that were considered relevant to the proposal in the guidelines issued for the PER (see Appendix 1). To address these factors, the proponent has carried out a number of detailed investigations as part of the preparation of this PER, including flora and fauna field surveys, Aboriginal heritage investigations and consultation, risk assessments, extensive public consultation and flight and aircraft noise exposure forecasts and modelling. Detailed accounts of these investigations and their outcomes are documented in the body and appendices of this PER. A summary of the key findings of the PER in respect of the relevant environmental factors, their current state, predicted impacts and proposed management and outcomes is provided in the following table.

Summary of Key Relevant Environmental Factors, Potential Impacts and Management Commitments

Environmental factor	EPA objective	Existing environment	Potential Impact	Environmental management	Predicted outcome
Vegetation Communities	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	Vegetation is Pindan on red sandplain which is common and widespread in the region and conserved in Coulomb Point Nature Reserve and in the proposed Waterbank Water Reserve. Vegetation condition is generally good, some grazing disturbances.	Clearing of approximately 200 ha of Pindan vegetation associated with airport development, spread of significant weeds.	Minimise clearing. Collection, storage and reuse of topsoil during rehabilitation, weed control measures.	Some local reduction in extent of Pindan vegetation. Affected vegetation type will remain widespread and well conserved in the region. Approximately 600 ha of this vegetation type will be retained within the airport land.
Declared Rare and Priority Flora	Protect Declared Rare and Priority Flora, consistent with the provisions of the *Wildlife Conservation Act 1950.*	No DRF or Priority Flora are known from the site despite survey. One priority species may occur in the site.	No known threatened taxa affected by the proposal. One species may be present.	Conduct additional, pre-construction seasonal flora survey proposed for May, following the summer rains. Development of any required management to CALM's satisfaction.	No reduction in the range of status of threatened flora taxa.
Terrestrial Fauna	Maintain the abundance, species diversity, geographic distribution of fauna.	Fauna recorded from the study area typical of the Pindan habitat and widespread in the region.	Some local reduction in habitat extent (clearing of approximately 200 ha of Pindan habitats). Minimal direct impacts on fauna.	Minimise habitat clearing. Prohibit construction and operation personnel brining forearms and pets into the project area.	No reduction in terrestrial fauna species geographical range or status attributable to the proposal.
Specially Protected (Threatened) Fauna	Protect Threatened Fauna and Priority Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950.*	No Schedule or Priority species are known from the site although One Schedule 1 species, one Schedule 4 species and one Priority 2 species are known from the area.	Habitat clearing is unlikely to impact on any species of significance.	Minimise habitat clearing. Prohibit construction and operation personnel brining firearms and pets into the project area.	No reduction in threatened fauna species geographical range or status attributable to the proposal.
Migratory Birds	Avoid impacts on migratory birds or their habitats. Meet Australia's international agreements on migratory birds.	Internationally significant migratory wader habitats and populations occur at Roebuck Bay, some 8 km south of the proposed relocation site and immediately adjacent to the existing airport site.	A lack of definitive knowledge on migratory bird departure bearings, but no known increase of birdstrike risk compared to existing airport site, reduced disturbance to Ramsar habitats based on increased elevation / alteration of flight paths and removal of the airport from the shores of the Bay.	Migratory bird departure watch to be carried out, implementation of bird hazard reduction procedures at relocated airport site, ongoing liaision with Broome Bird Observatory.	No significant increase in risk of bird strike likely compared to the existing site, reduced disturbance to Roebuck Bay wader habitats compared to existing site.

Environmental factor	EPA objective	Existing environment	Potential Impact	Environmental management	Predicted outcome
Landforms	Establish stable, sustainable landform consistent with surroundings.	Pindan sandplain with low undulating sand ridges in a fairly homogenous landscape, landforms widespread in the region.	Some flattening of local landforms, potential for erosion from run-off.	Develop and implement detailed landscape and drainage management plans.	No significant impacts to local or regional landform values.
Groundwater Quality	Maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993) and the NHMRC/ARMCANZ Australian Drinking Water Guidelines.	The preferred location of the airport overlies the southern portion of the Broome Water Reserve. This portion will be excised.	Potential for groundwater contamination from fuel and wastes.	Fuel will be stored in elevated and bunded tanks in accordance with DME guidelines. Sewage will be treated and disposed on-site in accordance with Health Department requirements. Solid wastes will be disposed off-site by licensed contractor.	No reduction in groundwater quality in the Broome Sandstone Aquifer.
Surface Water Quality	Maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993) and the NHMRC/ARMCANZ Australian Drinking Water Guidelines.	Drainage patterns are poorly developed and no significant drainage enters the site. Run-off will only occur following significant cyclonic downpour.	Potential off-site movement of contaminants when runoff is occurring. Erosion and ponding effects.	Runoff from hardstand areas will be collected in swales for transport offsite. Baffles in the swales will retard flows and increase infiltration. Any contaminants trapped in the upper soil profile can then be removed. A detailed Drainage Management Plan will be developed.	Quality of surface waters leaving the project area will be maintained at least to current levels.
Noise	Ensure that noise impacts emanating from the proposal comply with acceptable standards	There are no activities in the area which currently elevate noise levels above those levels occurring naturally.	Noise will be generated during the construction phase and during airport operations, but this will comply with relevant Australian Standards.	There are no noise sensitive residences that will be impacted during construction therefore no specific management measures are proposed.	Noise levels generated by the relocated airport will comply with or better Australian Standards.
Social Surroundings					
Noise	Ensure that the welfare and amenity of residents are not adversely affected.	There are no noise sensitive premises in the vicinity of the site proposed for the airport relocation.	There are no noise sensitive premises currently within the 20 ANEF contours predicted for airport operation at the proposed site for up to the year 2025.	No specific management measures are proposed for noise. The proponent will provide ANEF contour information to the Shire of Broome/ DOLA and participate in planning for adjacent land uses to ensure that planning is consistent with exceeds Australian Standard	No current or future landuses in within 20 ANEF contours surrounding proposed airport site.

Environmental factor	EPA objective	Existing environment	Potential Impact	Environmental management	Predicted outcome
Visual Amenity	Visual amenity of the area adjacent to the project should not be unduly affected by the proposal.	Pindan sandplain with low undulating sand ridges in a fairly homogenous landscape. Vegetated with open to dense Pindan vegetation.	Some flattening of landforms, potential for visual impact from Broome Road.	Development of detailed landscape plan provision of vegetated buffer to screen airport from the road.	No significant visual impacts or loss of visual amenity.
Aboriginal Culture and Heritage	Ensure that the proposal complies with the requirements of the *Aboriginal Heritage Act 1972*; and ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area.	No areas of significance to Aboriginal people occur within the proposed site.	No disturbance to areas of significance to Aboriginal people attributable to the proposal.	None required.	Aboriginal Heritage Act requirements met. No reduction in Aboriginal cultural values.
Culture and heritage	Ensure that the proposal complies with the requirements of the *Western Australian Heritage Act 1972* and the *Australian Heritage Commission Act 1975* are met and protect the identified values of places listed in the register of the National Estate.	No registered heritage sites occur within the proposed site for the relocated airport. Roebuck Bay listed on the register of the National Estate.	No impact on heritage listed sites. Flight path disturbances on Roebuck Bay reduced compared to current airport location (refer Migratory bird factor).	None required.	No impacts on heritage listed sites.
Public health and safety	Ensure that the proposal is managed so that the level of public risk meets the EPA's criteria for individual fatality risk off site and meets the DME's requirements in respect of public safety. Ensure that the public risk associated with construction and operation of the airport are as low as possible and in compliance with the criteria detailed in EPA Bulletins 611 and 627.	Current airport site situated in the Broome townsite and immediately adjacent to residences. Proposed site situated 12 km from the Broome town site and with no residences in immediate vicinity.	Greatly reduced public risks associated with proposed site compared to current site of airport operations, bird strike risk considered negligible.	Relocation to 12 km from the Broome town site, other management measures to reduce risks associated with fuel handling and waste management.	Reduction in public risks associated with airport and improved community safety.

In achieving the environmental outcomes for each factor as predicted in the preceding table, Broome International Airport Holdings makes the following commitments:

Proponents Commitment	Objective	Action	Timing	Whose requirements / advice
1. Prepare and implement an Environmental Management Plan	To ensure that environmental impacts are prevented or minimised in the design, construction and operation of the relocated Broome Airport.	Prepare and implement an Environmental Management Plan to address construction management issues (dust management, weed control, vegetation clearing and management) and operational management issues (potential contaminant handling and storage, waste management).	Develop prior to construction, implement during construction and operations.	CALM, DEP, Shire of Broome
2. Prepare and implement a Drainage Management Plan	To ensure that changes to surface hydrology and groundwater quality of the surrounding area are prevented or adequately managed.	Prepare and implement a Drainage Management Plan including identifying suitable hydrological parameters and design criteria, design and construction of drainage and pollutant controls, inspection and maintenance procedures.	Develop prior to construction, implement during construction and operations.	Water and Rivers Commission, Shire of Broome
3. Carry out a second seasonal flora confirmation survey	To ensure that any significant flora that may have been undetected due to seasonality are identified and managed.	Carry out second site flora survey and develop any specific management measures as appropriate.	Prior to construction. Proposed for May, following the summer rains.	CALM
4. Implement control of Declared Noxious weeds	To ensure that noxious weed infestations on the site are eradicated and not spread.	Eradicate known populations Implement control measures.	Prior to construction During construction.	CALM, Agricultural Protection Board
5. Prepare and implement a Landscape Management Plan	To maximise the retention of local landscape values and enhance the visual amenity of the finished airport.	Retain local landscape character and remnant vegetation. Undertake appropriate earthworks and planting treatments.	Develop during final design, implement during construction.	Shire of Broome
6. Carry out a migratory bird watch and continue liaison with Broome Bird Observatory	To improve the understanding of migratory bird routes in the Broome area and maintain aviation management to minimise bird strike risk.	Carry out migratory bird watch and continue liaison with Broome Bird Observatory to take account of any relevant information in management procedures.	Prior to construction, Operations	DEP, CALM
7. Continue consultation programme	To ensure that key stakeholders are kept appraised of developments.	Continue liaison with key stakeholders, public meetings / advertisements as appropriate.	Prior to and during construction.	Shire of Broome

PART I

Introduction and Project Background

1.0 Introduction

1.1 Project Background

Prior to the purchasing of Broome Airport by Airport Engineering Services Pty Ltd (now Broome International Airport Holdings [BIAH]), the Federal Government requested that BIAH enter into a Heads of Agreement with the Shire of Broome. This Agreement contracted BIAH to move the airport to a new site to be determined by BIAH and in consultation with all relevant authorities.

In January 1995, following discussions with the Premier, the Hon. George Cash, Minister for Lands, was requested to form a taskforce to carry out the identification of a site to accommodate the relocated Broome International Airport. This taskforce was to consist of a nominee from Department of Planning and Urban Development, a representative from Department of Land Administration (DOLA), representatives of the Broome Shire and representatives of BIAH.

Unfortunately this taskforce stalled in early 1996 due to Native Title issues. During this period DOLA commenced the Waterbank Station Study aimed at the Government's purchase of Waterbank Cattle Station and subsequent land trade-offs between the indigenous claimants of Native Title and other land usages. These land usages included infrastructure and tourism activities and a site for Broome International Airport.

It was therefore decided that DOLA's representative on Broome Airport Relocation Taskforce (BART) should be the Chairman of the Waterbank Station Committee as the majority of recognised sites for the new international airport were contained in the Waterbank Station area.

Since then the relocation of Broome International Airport had been recognised in a number of public documents including the Identification of Sites for Relocation of Broome Airport Study and the Waterbank Structure Plan (Government of Western Australia, 1999).

To assess community views on the various sites considered for the airport, a number of public meetings were held in Broome to obtain feedback from both the aviation industry and the community (see Section 1.6). Meetings with various interest groups and government agencies were also held as part of this process.

In early 1998 the Chairmanship of the taskforce for the Broome International Airport Relocation was transferred to the Minister of Transport nominee, as it was clear that the aviation issues were dominating the relocation process and therefore the Department of Transport's representative was more suited to lead this taskforce.

Following further public consultation and negotiations with regards to Native Title and Aboriginal Heritage, the taskforce identified the Southern Site, which is some 12 km from the town centre, as the preferred location for the airport (see Figure 1.1). Further detail on the process via which potential site options for the relocation were evaluated is provided in Section 2.3.

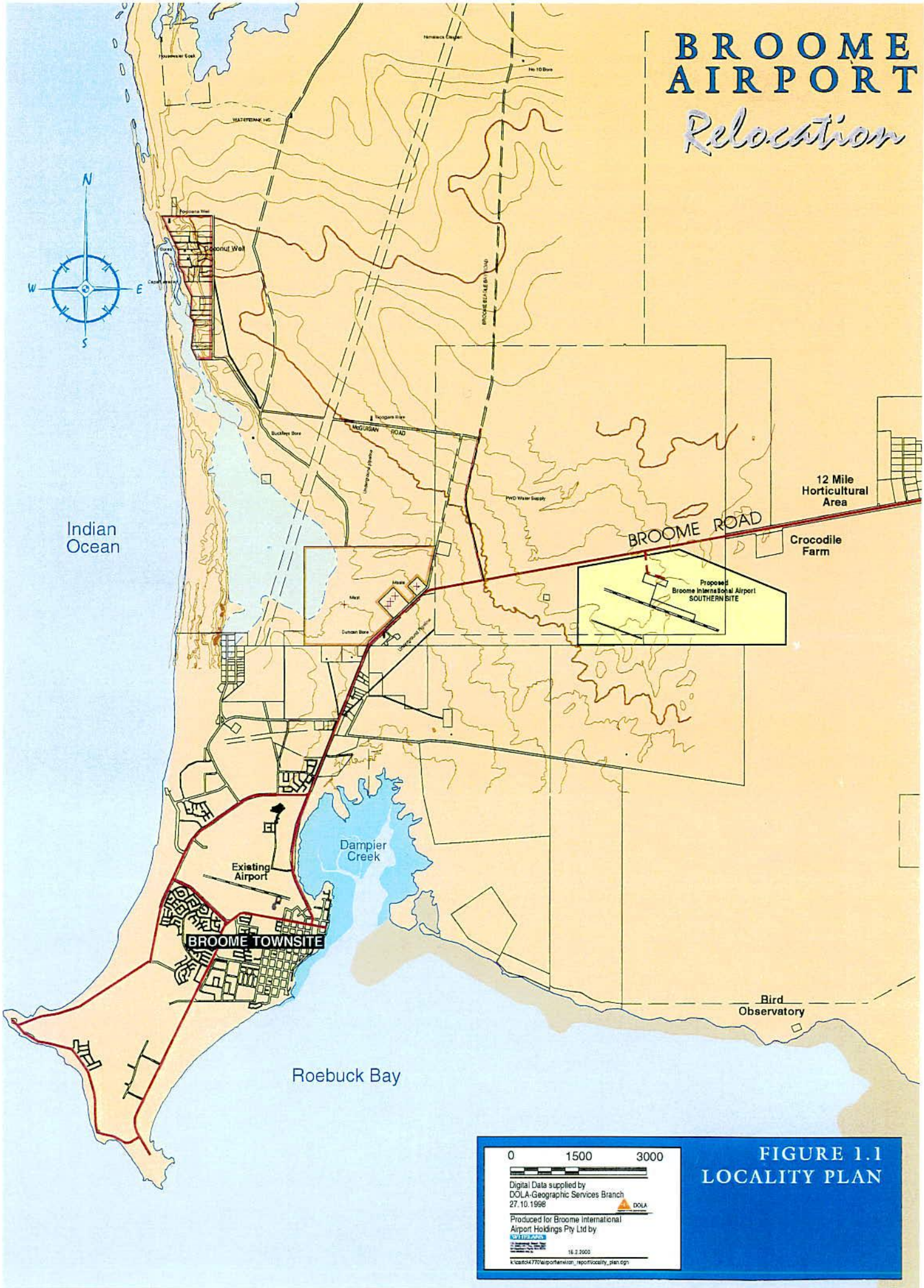


FIGURE 1.1
LOCALITY PLAN

To allow for the community, and in particular the aboriginal community, to understand the impact of an international airport on the chosen site, BIAH contracted Ansett to carry out mock take-offs and landings on the proposed site. Following this action and further community and aboriginal consultation, it was determined that this site should be presented to Cabinet as the site for the relocated Broome International Airport. Cabinet has now endorsed this site.

The Minister for Lands, the Hon. Doug Shave, has agreed that the airport relocation and the necessary land swaps within Waterbank Station could proceed independently of the Waterbank Structure Plan.

The Broome Airport Relocation Taskforce had reached its goal of selecting the site and was replaced with the Broome Airport Relocation Implementation Committee (BARIC). BARIC was convened to finalise all processes necessary to allow for the transfer of land for the southern site from Vacant Crown Land to Broome International Airport Holdings on a conditional lease basis and finally as a freehold site once the airport is operational.

Included in BARIC's task is the finalisation of any environmental approvals that are needed due to the relocation of the international airport from its current location to the southern site. The proposal to relocate the Broome Airport was referred to the Environmental Protection Authority (EPA) in September 1999. The EPA determined that the proposal would be assessed at the level of a Public Environmental Review (PER) and, after resolution of appeals, that it would be made available for public comment for a four week period.

1.2 Project Justification

It is anticipated that the existing Broome Airport site will cope with aviation demand for the foreseeable future (5-7 years). However, in the longer term there is pressure on both the areas available for aircraft parking and the use of larger aircraft for inbound tourism to Broome and the Kimberley.

Broome International Airport is now the second largest Regular Public Transport airport in Western Australia after Perth Airport and has achieved a growth rate over the last decade of 250%. Aircraft parking bays have increased from two to six and soon a further two aircraft parking bays will be finished, bringing the total to eight. Frequency of aircraft has increased from a maximum of three large aircraft to ten large aircraft per day plus a number of regional turbo prop aircraft from centres such as Derby, Halls Creek and Fitzroy Crossing.

The main requirement for relocation is to enable the timely development of the Broome township to the north of the airport including developing the airport land itself. Current advanced planning for the development of the Broome town site is shown in Figure 1.2.

All town planning documents for the future of Broome have shown development of the existing airport land. The current airport cuts the Broome Peninsular in two and prohibits planned development to the north.

Currently, the take-off paths from the existing airport site are over Cable Beach to the west and Chinatown to the east. The effect on residents is not excessive and in fact, is considered to be novel. However, as the town grows and the frequency of air traffic increases, it is considered that this novelty factor will become a nuisance.

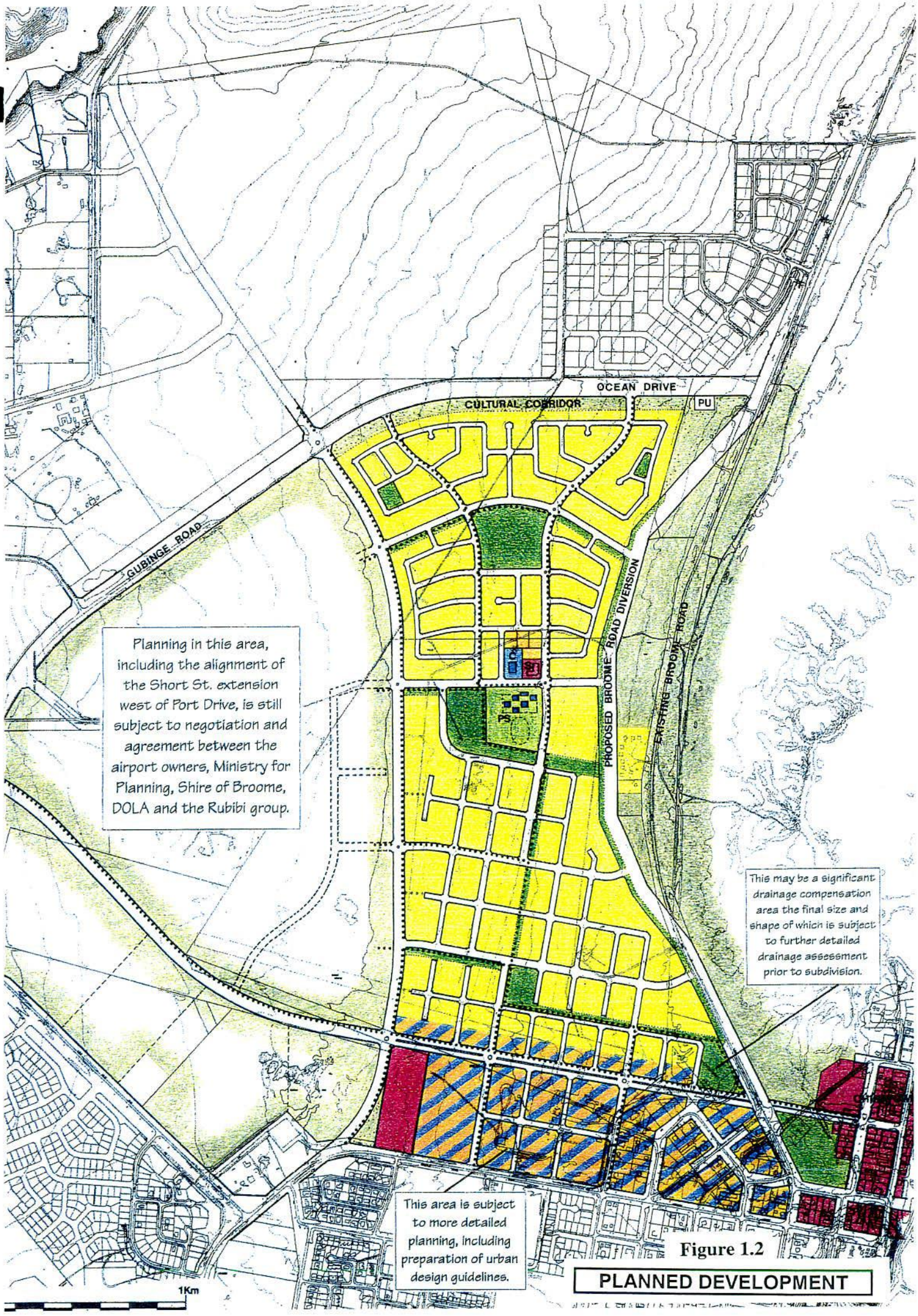


Figure 1.2

PLANNED DEVELOPMENT

Additionally, the current runway length of 2,026 metres is the final effective length of the runway. This runway length precludes the use of major wide-bodied aircraft, including the Boeing 747 series and the Airbus 340 series. In addition the Boeing 767 series and Airbus 300 series are restricted in their carrying fuel loads on take-off from Broome, which in turn limits the maximum destination that can be reached from the existing airport using these types of aircraft to Singapore and Sydney.

To finance the relocation of the airport, the existing airport land will be developed. The Western Australian Planning Commission (WAPC) has given permission for the northern section of the airport land to be developed. This development, named Roebuck Estate, is well under way with over 170 lots sold and 150 houses either completed or under construction, and a new primary school which opened in January 2000. The development of the northern section of the airport land was conditional upon the timely relocation of the existing airport.

The major benefit of the new site will be the orderly release of airport land at the current site for development, as both residential, tourist and commercial. The new site will have less social impact due to its increased distance from residential areas and will allow the airport to grow as the aviation demands on it increase.

Initially the airport will be designed to allow wide-bodied aircraft movement with full fuel and passenger loadings. The site has been chosen to allow for orderly runway extension that will cope for the largest jets currently in the aviation industry, namely the Boeing 747-400 and the A340.

In summary, the airport needs to be relocated due to:

- the long term restrictions to aviation requirements for wide-bodied aircraft movements;
- town planning requirements for the orderly expansion of Broome to the north;
- the Agreement between BIAH and the Broome Shire; and
- the commitments given to the WAPC and the State Government.

Additionally, due to the green field nature of the proposal, problems at the existing airport such as restriction of apron space, the necessity to have general aviation on the other side of the runway and overnight parking for larger jets also on the other side of the runway from the terminal complex will be rectified. The efficiency of the airport will increase with the ability to taxi regional jets on a parallel taxiway. This will avoid the need to back-track on the runway which in turn causes delays to both outbound and inbound aircraft and is an increased aviation hazard.

1.3 Project Timing

The commencement of works for the relocation of Broome International Airport is currently scheduled for July 2000.

Construction is planned to commence as soon as possible after obtaining all necessary approvals, including formal environmental clearances, and following completion of the land transfer process. Given formal timeframes, the Public Environmental Review process is likely to take a minimum of 4 months from the public comment period for this document. Construction will occur in a staged fashion over a period of approximately 5 to 7 years.

1.4 The Proponent

The proponent for the relocation of the Broome International Airport is Broome International Airport Holdings Pty Ltd (BIA). The proponent's contact details for the purposes of this proposal are:

Executive Director - Projects
Broome International Airport Holdings Pty Ltd
53 Wheatley Street
GOSNELLS WA 6110
Telephone: (08) 9490 2299
Facsimile: (08) 9490 1775

Note that submissions on this PER should not be forwarded directly to the proponent but should be directed to the EPA as per the invitation in the front of this document.

1.5 The Approvals Process

This proposal is subject to the requirements of the *Environmental Protection Act* 1986 and requires formal environmental assessment and approval in accordance with Part IV of the Act (Environmental Impact Assessment). The EPA has determined that the proposal is to be assessed at the level of a PER.

This document will be released for a public review period of four weeks. During this time, government agencies, private organisations and members of the community are invited to make submissions to the EPA on the proposal. The EPA will evaluate the PER document, the submissions received, and the proponent's response to those submissions and provide recommendations to the Minister for the Environment on the environmental acceptability of the proposal. The proponent and members of the public may then appeal the content of the EPA Report and Recommendations. After consideration of the EPA advice and any appeals received, the Minister may then approve the project subject to a range of Ministerial Conditions. Only after this Ministerial approval has been issued may other authorities issue approvals enabling the project to proceed.

These other approvals may include approval from:

- Water and Rivers Commission (in respect of groundwater extraction licences);
- Department of Transport;
- Shire of Broome (development application);
- Western Australian Planning Commission (amendments to the town planning scheme); and
- DOLA (reserve amendments, Native title requirements).

1.6 Consultation Programme

There has been a comprehensive history of public and agency consultation as part of the relocation of Broome Airport. A summary of some of the key elements of the consultation programme in chronological sequence is provided in Table 1.1 below.

Table 1.1: Summary of key activities in public consultation programme.

Date	Consultation Activity
Dec 97	Series of three public meetings held in Broome to discuss the Waterbank Structure Plan (WSP) including the potential sites for relocation of the airport. This included meeting with representatives of the Shire of Broome, Kimberley Land Council (KLC) and residents of Lullfitz Drive and Coconut Wells.
Jan 98	Broome Airport Relocation Taskforce (BART) formed.
Feb 98	Discussions with National Transmission Authority regarding flight paths and infrastructure conflicts.
Mar 98	Discussions with Water and Rivers Commission regarding potential to site the new airport on the water reserve. Agreement reached that this was achievable to the north of production bores.
	Public contacts for BART advertised in shire newsletter.
	Discussions with local aviation operators.
	BART chairman meets with CEO of DEP.
May 98	Meeting between BART and Aboriginal elders to discuss concerns. Agreed that northern option would be abandoned and southern option preferred.
Sep 98	Meeting with Broome Crocodile Farm to discuss concerns about noise and flight paths.
Oct 98	Further meetings with KLC representatives to discuss flight paths and other details.
	BAe.146 chartered by BIAH to provide representative overflight for the benefit of Aboriginal people and local residents.
Nov 98	Decision to move runway east to recognise Aboriginal concerns, but not further north (to avoid impacting the Crocodile Farm) or south (to avoid impacts on migratory bird habitat).
Jan 99	Discussions with Broome Bird Observatory regarding potential bird impacts and bird strike risk.
Feb 99	Information article published in Shire newsletter and advertisement of public meeting in March.
March 99	Met with Broome Bird Observatory to discuss migratory bird issue. Observatory agrees to further investigate potential bird migration routes.
	Public meeting held in Broome (80 attendees)
	Public information pamphlet made available.
Apr 99	Meeting between BART and President of Coconut Wells ratepayers association.
Aug 99	Meeting between BART and Chairman of the EPA.

A comprehensive account of the consultation activities, minutes of meetings, outcomes, respondents and media is contained in Appendix 2 of this PER.

2.0 The Proposal

2.1 Project Location

The preferred location for the relocated airport, as identified in the Draft Waterbank Structure Plan (Government of Western Australia, 1997), is within the southern portion of Water Reserve No. 25716 south of the Great Northern Highway approximately 12 km from the town centre (see Figure 1.1). The site to be rezoned under the Broome Town Planning Scheme for airport use is approximately 817 ha in total (Landvision, 1999).

The site is predominantly occupied by the southern portion of Water Reserve No. 25716 and Pastoral Lease No. 40844. A grazing lease exists on the Water Reserve land with a herd of cattle having extensively grazed the area for a number of years. The Water and Rivers Commission has indicated that this portion of the water reserve will be excised for the purposes of the relocated airport.

2.2 Project Description and Scope

The proposal consists of relocating the Broome Airport from its current site in the town centre to a new location approximately 12 km from Broome. The land occupied by the current airport site would then be made available for the expansion of the Broome town site (current landuse planning for this area is shown on Figure 1.2).

The proposed new airport site will allow for:

- one main runway of initially 2 700 metres in length x 45 metres in width allowing for unrestricted Boeing 767-300 operations;
- capacity to extend the runway length to up to 3 500 metres to allow for Boeing 747 aircraft;
- parallel taxiway;
- turning nodes;
- apron parking for up to ten aircraft;
- general Aviation (GA) parking;
- maintenance and storage hangars;
- terminals – domestic and international;
- fuel storage;
- future short parallel runway for light aircraft; and
- land side and airside commercial activities.

Construction is estimated to cost approximately $40 million and will be phased over five to seven years subject to land sales on the existing airport site. The ultimate configuration and detailed design of the relocated airport and support infrastructure will be the subject of detailed engineering design and land use planning.

Power will be supplied to the relocated airport via a high voltage 11 KV line to be constructed along Broome Road as an outcome of the Power Purchase Agreement currently being finalised by the State Government. The operational airport will also have stand by power generation facilities and construction power will be supplied by generators as required.

Figure 2.1 shows an aerial photograph of the proposed location for the relocated Broome Airport. Planned flight paths, heights of aircraft at key points and general configuration of the main runway is shown in Figures 2.2 and 2.3. These Figures also show the current flight paths and existing location of the Broome airport. The flight paths planned for the proposed relocation site have been modified to take a range of factors into account including impacts on sites of significance to Aboriginal people, aeronautical safety requirements, other physical constraints and noise impacts to the Coconut Wells community. Projected frequency plumes of the planned flight paths that overfly potentially sensitive areas are provided in Appendix 3.

The key characteristics of the proposal are summarised in Table 2.1.

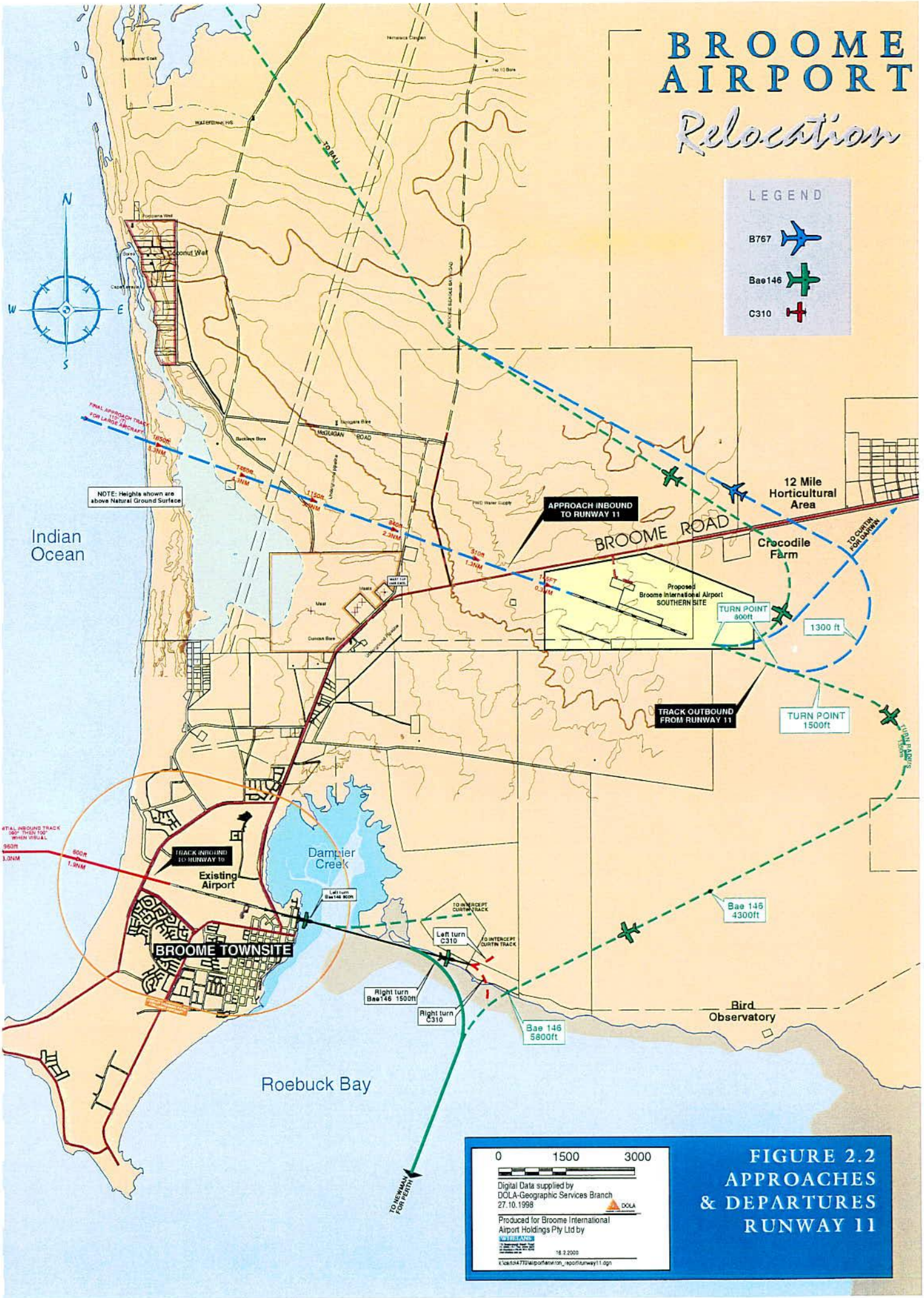
Table 2.1: Key Characteristics of the Proposal

Element	Description
Construction duration of project	Staged over 5-7 years
Operational life of Relocated Airport	Indefinite
Major components	• 2 700 m long Main runway (possible ultimate length up to3500 m) • parallel taxiway • turning nodes • general aviation parking • apron aircraft parking • maintenance and storage hangars • terminal and commercial buildings • fuel storage facilities • future light aircraft runway
Fuel storage capacity and use	• storage capacity of approximately 400 000 litres of Jet A1 and 100 000 litres of Avgas • approximately 24 million litres throughput per year (driven by passenger numbers)
Water supply	• Dedicated borefield to be constructed • Estimated approximately 75 m^3 of water per average day (27 000 m^3 pa)
Power Supply	• Mains supply via a high voltage 11 kv line
Approximate area of disturbance	• Approximately 200 ha, subject to final design

2.3 Evaluation of Options

The Waterbank studies originally outlined ten possible sites for the relocation of Broome airport which were presented as a series of public meetings in December 1997 (see Figure 2.4).

FIGURE 2.1
ORTHOPHOTO


BROOME AIRPORT
Relocation
LEGEND
B767
Bae146
C310
N
W
E
S
Indian Ocean
NOTE: Heights shown are above Natural Ground Surface
APPROACH INBOUND TO RUNWAY 11
BROOME ROAD
12 Mile Horticultural Area
Crocodile Farm
TO CURTIN FOR DARWIN
Proposed Broome International Airport SOUTHERN SITE
TURN POINT 800ft
1300 ft
TURN POINT 1500ft
TRACK OUTBOUND FROM RUNWAY 11
TRACK INBOUND TO RUNWAY 30
Existing Airport
Dampier Creek
BROOME TOWNSITE
Left turn C310
Right turn Bae146 1500ft
Right turn C310
Bae 146 4300ft
Bae 146 5800ft
Bird Observatory
Roebuck Bay
TO NEWMAN FOR PERTH
0 1500 3000
Digital Data supplied by DOLA-Geographic Services Branch 27.10.1998
Produced for Broome International Airport Holdings Pty Ltd by
FIGURE 2.2
APPROACHES & DEPARTURES RUNWAY 11

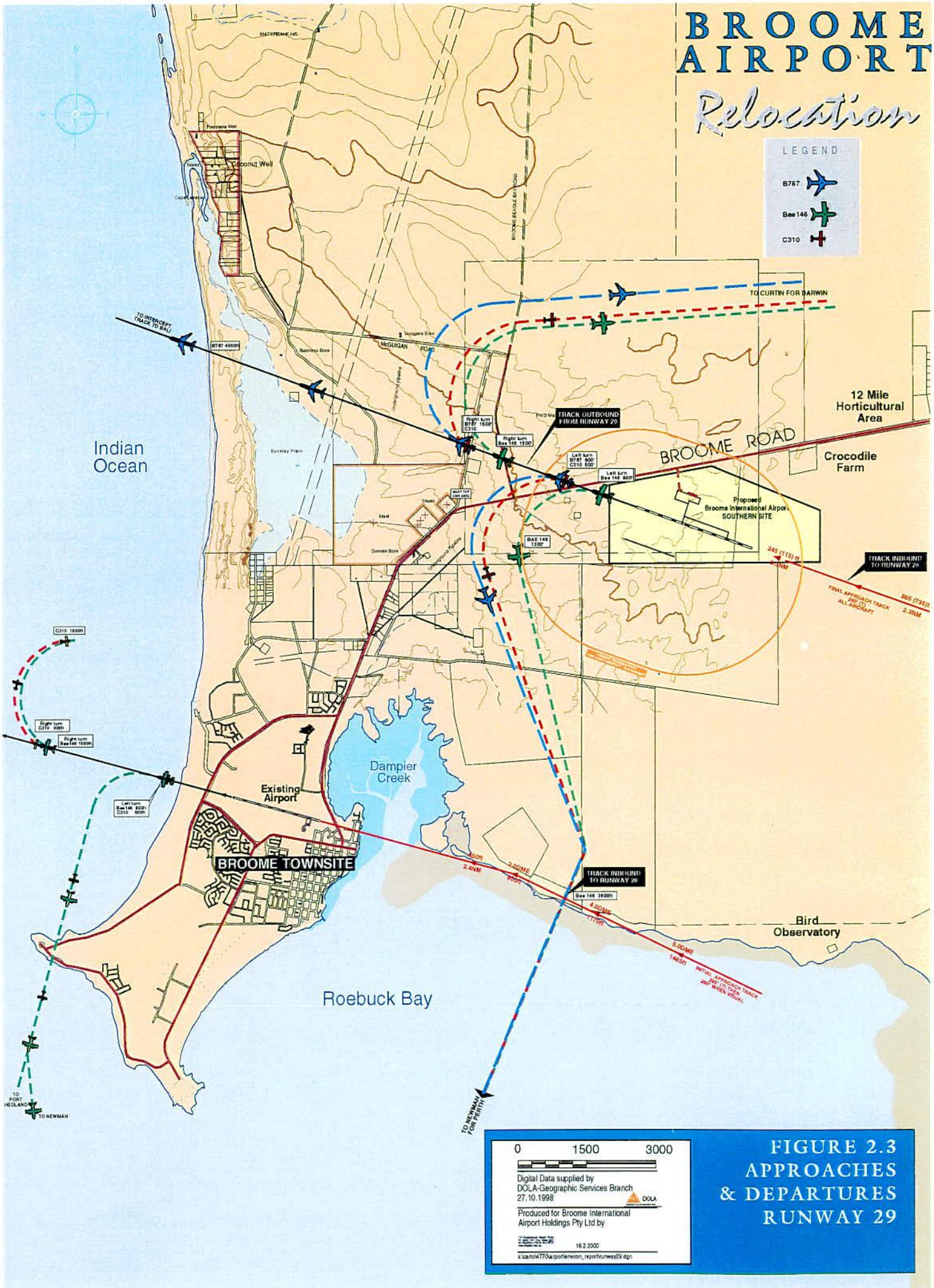


FIGURE 2.3
APPROACHES
& DEPARTURES
RUNWAY 29

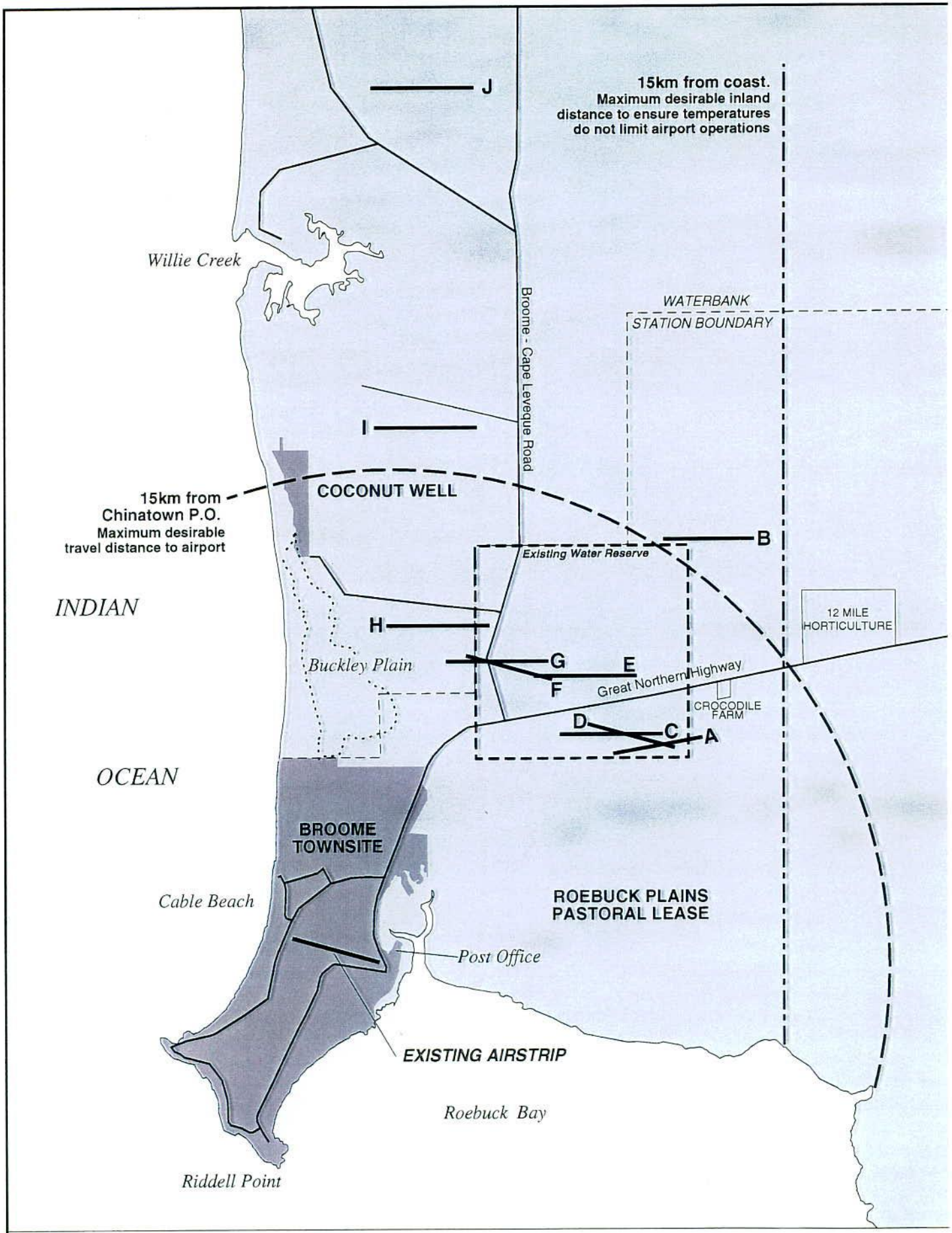


FIGURE 2.4
AIRPORT OPTIONS

(FIGURE 7 DRAFT WATERBANK SERVICES PLAN)

These sites were evaluated by several working groups as part of an ongoing and transparent public consultation process (see Section 1.5; Appendix 2). This process took into consideration the following criteria in evaluating the options for the site of the relocated airport:

- Aviation safety, management and industry requirements.
- Aboriginal heritage values and the views of Aboriginal people with cultural ties to the region.
- Climatic data and constraints such as wind speeds and direction and ambient temperatures (relevant to aircraft take off capabilities) (a maximum of 15 km from the coast was identified).
- The desire by the Shire of Broome, residents and others to have the relocated airport within a reasonable distance from the Broome town site (a maximum of 15 km from the Chinatown Post Office was agreed).
- Engineering design issues and constraints, including geotechnical conditions.
- Biological values (flora and fauna, particularly migratory birds and the coastal zone).
- Community and social impacts (particularly noise impacts and the alignment of flight paths).

Following more detailed analysis, the initial ten sites under consideration were narrowed down to two sites, A and B of the initial study (Figure 2.4), which were identified as the Northern and Southern Sites. A summary of the reasons which the other eight sites were rejected is provided in Table 2.2.

Table 2.2: Summary of factors for rejected site options for the Broome airport relocation

Option	Contributing factors
C	1.5 km closer to the coast and would required relocation of the National Transmission Agency tower ($1.5 million in capital costs) Overflights of land significant to Aboriginal people
D	Similar problems to Option C Adverse impacts on land significant to Aboriginal people
E	Overflights of land significant to Aboriginal people
F	Significant costs for water and road infrastructure relocation Overflights of land significant to Aboriginal people
G	Significant costs for water and road infrastructure relocation Overflights of land significant to Aboriginal people
H	Impacts on Coconut Wells area Overflights of land significant to Aboriginal people
I	At the limit of acceptable distance from Broome town site High infrastructure costs Significant environmental and social issues
J	Too far removed from the Broome town site Costs to the community in travel and infrastructure Significant environmental issues

On strictly aviation selection processes the Northern Site was preferable to the Southern Site. However, the Northern Site included land adjacent to areas that have significant indigenous cultural significance and was therefore rejected.

The selected Southern Site is the next best site on the basis of aviation selection criteria and the impact of the airport on the community. This site does not adversely affect indigenous cultural activities and is superior to all other sites that were under consideration under the Draft Waterbank Structure Plan (Government of Western Australia, 1997).

Once selected, the configuration of the proposal for the Southern Site was further modified in response to a range of community and other agency inputs arising from the consultation programme (see Appendix 2; Section 1.6).

Issues addressed in this process included:

- Modification of flight paths to avoid direct overflight of the Coconut Wells and Willies Creek areas and conflicts with the National Transmission Authority broadcasting masts.
- Movement of the main runway to the east to meet the concerns of the KLC.
- Further modifications to flight paths to recognise aeronautic and safety requirements.
- **The 'Do nothing' Option**

When the 'Do nothing' option was considered (i.e. leave the airport in its current location), the following conclusions were reached:

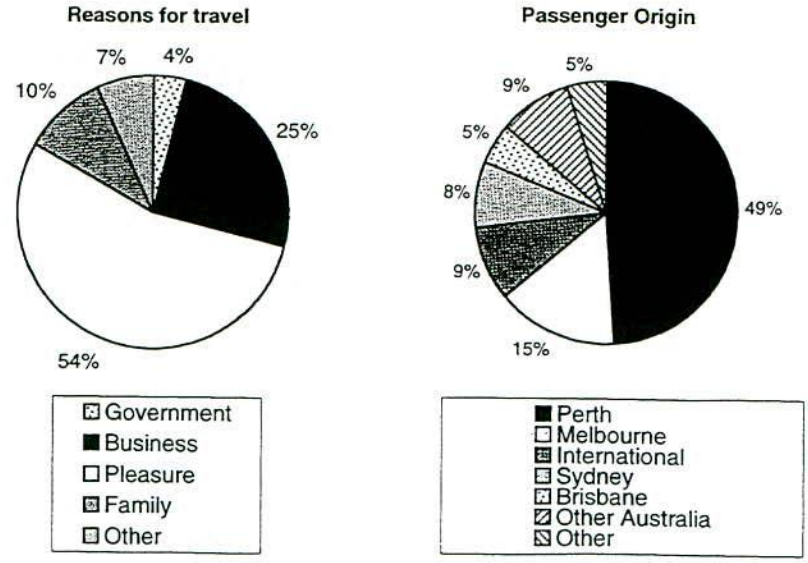
- In the medium to long term, if Broome International Airport is not relocated then there will be considerable constraint on the ability of Broome to grow and the ability of the airport to service the demands that would be placed upon it (see Section 1.2). In effect, the northern gateway to the State of Western Australia would be capped. The resulting impact on this region of Western Australia would be catastrophic. Tourism is emerging as the prime source of employment for this area and tourism activity is reliant on a regional airport that can cope with the requirement of increased inbound activity.
- Noise and other collateral impacts from increasing activity at the airport would continue to be centred in the heart of the Broome town site where they impact on the maximum number of local residents.
- If the airport is not relocated, BIAH will be in breach of agreements with both the Broome Shire and the State Government.

After due consideration of these factors, the 'do nothing' option was rejected in favour of the benefits presented by relocation of the airport to the southern site.

2.4 Flight Forecasting and Anticipated Use

Broome International Airport was one of Western Australia's busiest regional airports in 1997 with 170 448 passenger movements. A flight forecasting study was carried out by Kubu Australia Pty Ltd to examine projections for passenger and aircraft movements at Broome airport up to 2025 (see Appendix 3). Forecasts were based on statistical extrapolation from historical traffic at Broome airport and an assessment of other factors, including direct international flights, that may influence future demand. This included a passenger study with an origin / destination survey and an analysis of reasons for travel. The outcomes of this assessment are summarised in Figure 2.5.

Figure 2.5: Broome Passenger origin and reasons for travel



The passenger study indicated that a significant proportion of Broome's passenger traffic is attributable to tourism. The study split air traffic into two preliminary strands – the tourist associated strand (80% of traffic) and the local resident associated traffic (20%). The peak periods for passenger movements were during the period June to October, coinciding with the peak tourist season for Broome.

Forecasts for future passenger and flight movement figures at Broome considered factors such as State and National Gross Domestic Product projections, projections of Broome's likely population increases, regression analysis based on historical flight numbers and planned changes in flight linkages and aircraft servicing the airport. Adopted forecast estimates for passenger numbers and flight movements arising from this work are provided in Table 2.3.

Table 2.3: Summary forecasts for passenger and flights at the Broome Airport

Year	Passengers	Airline movements	Total aircraft movements
1999	178 064	5 122	13 492
2015	513 697	9 014	24 234
2025	742 898	12 023	34 343

A more detailed analysis of the types of aircraft contributing to the total projected movements, their proportional activity at the Broome airport and expected day / night operation was also carried out. Forecast airline aircraft types and capacities for Broome Airport are provided in Table 2.4.

Table 2.4: Forecast aircraft types servicing Broome Airport

Aircraft type	Passenger Capacity	Current Aircraft	Future Aircraft
Large capacity jets	200-250	767	767
Medium capacity jets	100-150	737-300	737-400 / 300 A318/19/20/21
Small capacity jets	70	BAe146-200, BAe146-100, F28	BAe 146-200, BAe 146-100, Challenger
Medium capacity turboprop	30	Brasilia	Brasilia
Small capacity turboprop	18	Metroliner	Metroliner

Most changes forecast in the types of aircraft servicing the airport are due to the gradual phasing out of older types and replacement with more current aircraft. Legislation is in place that older, noisier types of aircraft (such as the Fokker F28 aircraft) are phased out of service over the period from 1995 to 2002. A table identifying these aircraft and relative sizes is provided in Appendix 4. Other smaller aircraft also utilise the airport including a Coastwatch DHC8 and general aviation light aircraft. These currently account for more than 60% of the aircraft movements at the Broome airport and it is projected that this proportion will grow substantially over time (see Table 2.5).

Table 2.5: Breakdown of aircraft movement projections by classification (see Appendix 3 for detailed breakdowns of aircraft type projected frequencies).

Classification	1999	2010	2025
Airline (see Table 2.3 for types)	5 122	9 014	12 023
Coastwatch DHC8	520	520	520
General aviation	7 850	14 700	21 800

Flight frequency plumes were also developed based on the forecast data, wind strength and direction data and other variables that affect aircraft flight paths (see Appendix 3). Frequency plumes for flight paths that affect potentially sensitive receivers and areas are also provided in Appendix 3. These frequency plumes and the flight forecasts were fundamental to the noise assessment carried out for this proposal (see Section 7.0).

Frequency plumes were prepared for the three forecast scenarios (1999, 2010 and 2025). These show that in the immediate future there would be approximately a 50% split between the north east bound and south bound tracks on departure with no flights along the international flight path until tie ins with international routes are resolved. In the longer term, the proportion of flights along the three routes remains fairly constant, with about 1 in 10 flights departing along the international route to the west up until 2025 (see Figure 2.6).

BROOME AIRPORT Relocation

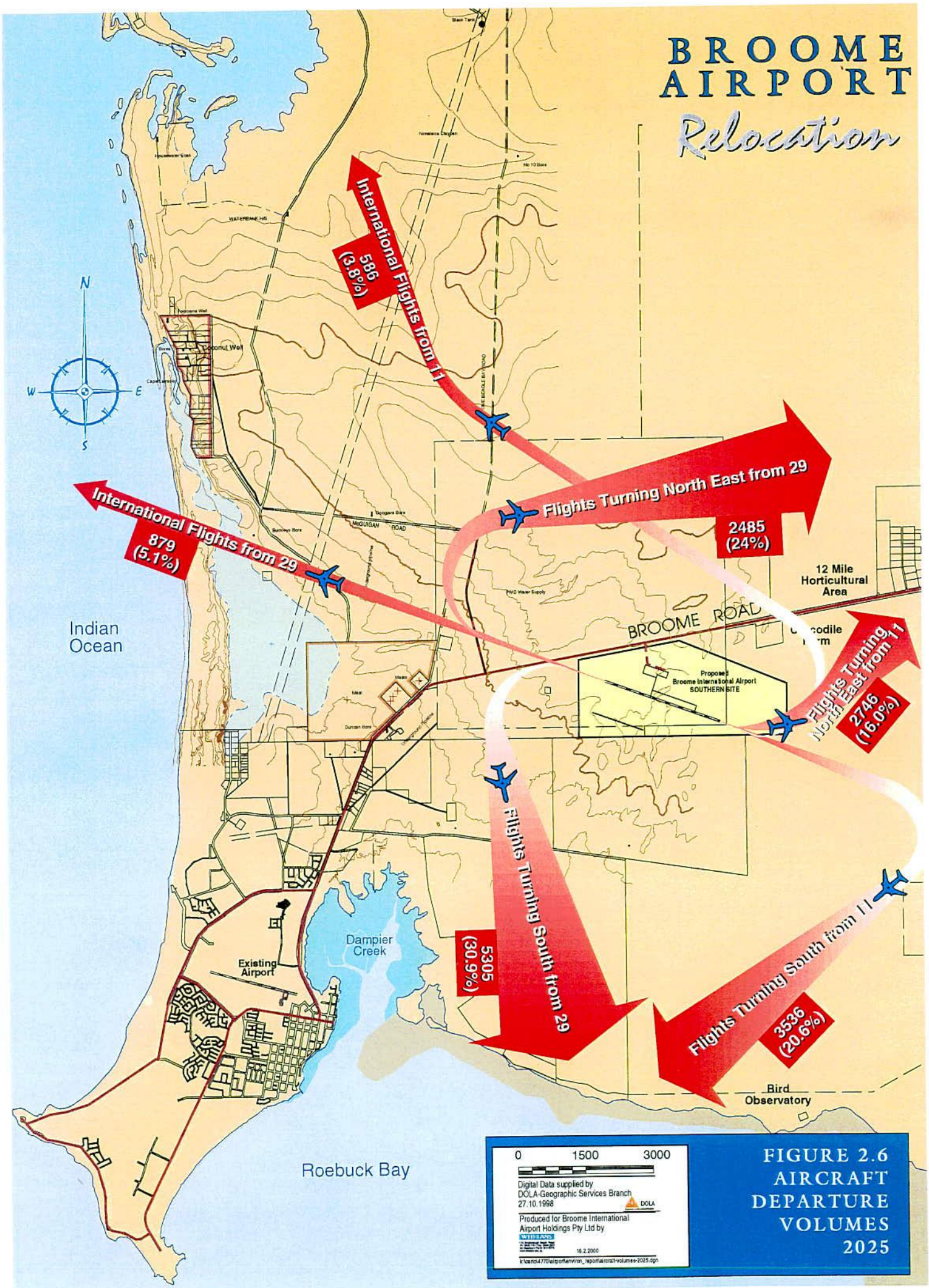


FIGURE 2.6
AIRCRAFT
DEPARTURE
VOLUMES
2025

PART II

Potential Impacts and Their Management

3.0 Terrestrial Flora

3.1 Background and Methodology

The area proposed for the relocation of the Broome International Airport was surveyed on the 11th and 12th November 1999. Relevant officers from the Department of Conservation and Land Management (CALM) and the Department of Environmental Protection (DEP) were consulted in relation to the methodology to be employed and the general scope of the field survey. The total survey area comprised approximately 800 ha.

Thirteen vegetation survey sites were located across the survey area. Due to the uniformity of the Pindan vegetation across the area, the majority of the sites occurred within *Acacia eriopoda* dominated shrublands. Two sites were established within minor variations which featured significant amounts of other shrub species, while two sites were established within burnt areas in the eastern portion of the survey area.

Flora and vegetation were surveyed within 100 m by 100 m quadrats. The following parameters were recorded for each quadrat:

1.	Location	Recorded using a hand-held Global Positioning System (GPS) to an accuracy within 22 m;
2.	Vegetation	Type Broad description based on dominant species and strata;
3.	Landform	Consistently recorded as 'Sandplain';
4.	Substrate	Consistently recorded as 'Red earthy sand';
5.	Organic Litter	Percent cover of leaf litter;
6.	Disturbance Details	Evidence of grazing, vehicle tracks, fire etc; and
7.	Percent Foliar Cover	Cover estimates were based on five cover classes: 0-2 %, 2-10 %, 10-30 %, 30-70 % and 70-100 %. Cover was visually estimated for a number of strata (based on life-form and height eg trees >5 m tall, trees <5 m tall etc), and for each species within each stratum.

Additional traverses (by car and on foot) were conducted to ground truth the apparent uniformity of the pindan vegetation evident from aerial photographs, and opportunistic sampling was conducted to supplement the species list.

Flora species were identified in the field or specimens were collected for later identification using the resources of the Western Australian Herbarium.

3.2 Vegetation and Flora

3.2.1 Vegetation

The vegetation of the project area consisted entirely of Pindan on red sandplain. 'Pindan' is a term used to described a grassland wooded by scattered trees, generally eucalypts, with a variably dense middle layer of wattles (*Acacia* species) (Kenneally *et al.,* 1996). This is the characteristic vegetation of the low-relief undulating sandplains which dominate the interior of the Dampier Peninsula (Kenneally *et al.,* 1996). Detailed descriptions of each flora survey site are contained within Appendix 5.

The Pindan within the project area featured a sparse to open cover of trees of a variety of species, predominantly eucalypts: Dampier's Bloodwood *Corymbia dampieri,* Cabbage Gum *C. flavescens,* Broome Bloodwood *C. zygophylla* and Grey Box *Eucalyptus tectifica.* Other tree species recorded included Northern Kurrajong *Brachychiton diversifolius* subsp. *diversifolius,* Sandpaper Fig *Ficus opposita,* Helicopter Tree *Gyrocarpus americanus* subsp. *pachyphyllus* and Cocky Apple *Planchonia careya.* Tall shrubs (between 3 and 5 m in height) provided a dense cover and were typically dominated by Broome Pindan Wattle *Acacia eriopoda,* with small portions of the survey area dominated by Cole's Wattle *Acacia colei* var. *colei* and Wongai *A. tumida,* or Ironwood *Erythrophleum chlorostachys.* This shrubland dominated by *Acacia eriopoda* is typical of the Pindan which dominates the southern half of the Dampier Peninsula (Kenneally *et al.*, 1996).

The majority of *Acacia* individuals in burnt areas were dead, hence the tree stratum in these areas was visually dominant. Other species encountered at lesser densities within the tall shrub stratum (>1 m) included Turpentine Tree *Gardenia pyriformis* subsp. *keartlandii, Hakea macrocarpa,* Kimberley Bauhinia *Lysiphyllum cunninghamii* and Supplejack *Ventilago viminalis.* Shrubs less than 1 m tall provided a generally sparse cover. *Corchorus pumilio* was the dominant low shrub, occurring with lesser densities of species such as Conkerberry *Carissa lanceolata, Corchorus sidoides, Crotalaria medicaginea, Hybanthus aurantiacus, Solanum cunninghamii* and *Waltheria indica.*

At ground level there was typically a dense cover of grasses, which consisted of varying proportions of Feathertop Spinifex *Triodia* (previously *Plectrachne*) *schinzii* and Erect Kerosene Grass *Aristida holathera* var. *holathera.* Other grass species recorded included *Eriachne melicacea,* Northern Wanderrie Grass *Eriachne obtusa* and Plume Sorghum *Sorghum plumosum.* Herbs provided a sparse cover and typically included *Bonamia linearis, Buchnera ramosissima,* Marbled Pigeon Pea *Cajanus marmoratus,* Woolly Glycine *Glycine tomentella* and *Spermacoce auriculata.*

As only one vegetation type occurs in the study area, no vegetation map has been provided. However, representative photographs of the Pindan are provided in Plate 1 and an aerial photograph of the site is provided in Figure 2.1.

3.2.2 Flora

A total of 70 species of vascular flora, from 59 genera belonging to 36 families, was recorded from the survey area (see Appendix 6). The low number of species is a reflection of:

- the small size of the survey area;
- the uniformity of the Pindan vegetation; and

- the timing of the survey. The November survey was not optimal for the collection of ephemeral species as it followed the dry season. Despite this, 19 (27%) of the species collected represented annual or weakly perennial species.

The families represented by the greatest number of taxa within the survey area were the Papilionaceae (peas; nine species), Poaceae (grasses; five species) and Caesalpiniaceae (cassias), Mimosaceae (wattles) and Myrtaceae (eucalypts), each with four species. The genera represented by the greatest number of taxa were *Acacia* (four species), and *Corymbia* and *Tephrosia* (three species each). The most commonly recorded species were *Acacia eriopoda, Corchorus pumilio* and *Triodia schinzii*, present at all of the 13 detailed flora survey sites.

Three weed species were recorded, one of which is a Declared Noxious weed:

- Belly-ache Bush **Jatropha gossypiifolia* Approximately 15-20 individuals of this species were observed towards the northern boundary of the project area, ~500 m west of Site 6. This species is a Declared Noxious weed in the Northern Territory and West Kimberley. Agriculture Western Australia (Broome office) will be notified of the occurrence of this species within the survey area;

- Bush Basil **Ocimum basilicum* This species occurred in dense stands around the stock watering point in the southwestern portion of the survey area; and

- Coffee Senna **Senna occidentalis* Scattered individuals of this species occurred at the same stock watering point.

3.3 Threatened Flora

A search of CALM's Threatened (Declared Rare) Flora database, Priority Species List and the Western Australian Herbarium Specimen database was commissioned for the Broome area (see Appendix 7). Five species of conservation significance were identified as having been collected in the vicinity of Broome (see below). None of these species were recorded from the survey area, and it is considered that only one of these (*Glycine pindanica*) may occur:

- *Pandanus spiralis* var. *flammeus* Declared Rare Flora

This species is known only from the type specimen, which was collected from Logues Spring, southeast of Broome. It is restricted to a narrow gorge with a series of water holes, a habitat absent from the project area.

- *Keraudrenia exastia* ms. (previously *Keraudrenia* sp. Broome) Priority 1

This species is in the process of being raised to Declared Rare Flora status. It is known from only two collections, between 1 and 6 km from Broome, and appears entirely restricted to that locality (Tim Willing, CALM Broome, pers. comm.)

- *Glycine pindanica* Priority 1

This species is represented in the WA Herbarium by nine specimens, all of which were collected from the Dampier Peninsula north of Broome. Given that a number of these specimens were collected from disturbed sand on roadsides in Pindan vegetation, it is possible that *G. pindanica* may occur within the area proposed for the Broome International Airport relocation.

G. pindanica was not recorded during the current survey. Although conditions were not ideal for sampling, other pea species with similar growth forms to *G. pindanica* were collected; hence it is considered unlikely that this species does occur within the project area.

- *Nicotiana heterantha* Priority 1

This species is known from five collections, from between 7 and 15 km north of Broome on the Dampier Peninsula. The preferred habitat of this species appears to be the understorey within *Melaleuca acacioides* forest (Tim Willing, CALM Broome, pers. comm.) This vegetation type is absent from the project area.

- *Pittosporum moluccanum* Priority 4

This species is represented by four collections from Western Australia; two of these are from islands of the Bonaparte Archipelago, while two are from the Dampier Peninsula. *P. moluccanum* occurs on sand dunes, a habitat which does not occur within the survey area.

3.4 Potential Impacts and Their Management

The main potential impacts to flora and vegetation resulting from relocation of the Broome International Airport are:

- vegetation clearing;
- spread, export or introduction of Weeds; and
- dust.

These potential impacts are described in detail below.

3.4.1 Vegetation Clearing

Clearing represents the major impact to the vegetation of the project area associated with the proposal. Airport construction on the proposed location will result in the clearing of approximately 200 ha of native vegetation, comprised entirely of *Acacia eriopoda* on Pindan sands.

The *Acacia eriopoda* dominated Pindan has no special conservation significance. While it appears that virtually no work has been conducted into variation within pindan (Tim Willing, CALM Broome, pers. comm.), this vegetation type is known to be very widely distributed on the southern half of the Dampier Peninsula (Kenneally *et al.,* 1996). *Acacia eriopoda* and *A. tumida* dominated pindan represented the dominant vegetation types recorded along the Great Northern Highway, from Broome east to a point ~60 km east of the Derby turn-off (Halpern Glick Maunsell, 1997).

The Pindan vegetation community is considered to be well conserved in the Coulomb Point Nature reserve, which lies 80 kilometres to the north of the airport site. This reserve contains approximately 22,940 hectares of the Pindan vegetation community (pers com. Tim Willing CALM, Broome). A further 80,000 hectares of Pindan vegetation is contained within the proposed Water Reserve which lies immediately north of the airport site (Government of Western Australia, 1999).

The airport site is approximately 817 hectare in size of which approximately 200 hectares will be removed for the airport development. This will result in more than 600 hectares of Pindan vegetation being retained within the site.

Given the above, the removal of 200 hectares of Pindan vegetation for the proposed development will not have a significant impact on the distribution of this vegetation community within the region.

In addition, the vegetation to be removed within the project area is only in moderate condition. While it is largely unburnt, the area has been extensively grazed over a number of years, supports localised patches of weeds and is traversed by several vehicle tracks.

The area does not support a particularly diverse flora. No species of particular conservation significance have been recorded from the survey area. Only one species, the Priority 1 *Glycine pindanica,* has the potential to occur. None of the species recorded have restricted distributions.

To minimise impacts to flora and vegetation as a result of physical disturbance, clearing will be kept to the minimum required for safe operations. Areas that are temporarily disturbed during construction will be rehabilitated as required. In addition, the proponent has committed to conduct further seasonal flora sampling (see Section 10.0). This will supplement the current flora species list by increasing the number of ephemeral species recorded and will confirm whether the Priority 1 species *Glycine pindanica* is present within the survey area. Management strategies specific to *G. pindanica* will be developed if this species is shown to occur (see Section 10.0).

3.4.2 Weeds

There is the potential for existing weed species to be spread within the project area during construction or exported to other locations, and for new weeds to be brought into the airport by overseas or interstate travellers.

**Jatropha gossypiifolia,* a Declared Noxious weed, occurs within the project area and specific control measures will be required to prevent the dispersal of this species. The proponent has committed to undertake eradication measures prior to the commencement of construction (see Section 9.0). Control measures at this stage would be particularly effective as the population is at present small and localised. The recommended control is manual removal and burning of the individual plants. Care must be taken to remove as much of the tuberous root system as possible, since new shoots can develop from root material (Parsons & Cuthbertson, 1992).

The proponent will commit to other construction phase management as part of an EMP to reduce the spread of weed species (see Section 10.0). This will include wash down of plant and equipment prior to entry and exit from site and spoiling of weed infested topsoil, particularly in the vicinity of the watering point in the south west of the project area.

Exotic plant material confiscated from travellers passing through the airport will be disposed of in accordance with the *Quarantine Act, 1901* as is currently occurring at the existing Broome airport.

3.4.3 Dust

Construction works associated with this proposal have the potential to generate dust. This may adversely impact vegetation in the surrounding area. Standard dust suppression techniques will be applied to reduce impacts to adjacent vegetation from dust generated during construction (see Section 10.0).

3.5 Outcomes and EPA Objectives

The vegetation and flora of the site are widespread in the region, are well conserved in existing and proposed reserves in the region and have no particular conservation significance. No declared rare or priority taxa are known to occur in the site or were recorded during field surveys. Further seasonal sampling in about May, following the summer rains, will be conducted to confirm that the Priority 1 *Glycine pindanica* is not present within the project area. If this species is recorded during follow-up work, then management strategies will be developed to the satisfaction of CALM to ensure the conservation status of this species is unaffected by the development. The amount of clearing required for the project is minimal compared to the distribution of the vegetation type in the region. The Declared Noxious weed **Jatropha gossypiifolia* will be eradicated, and weed-infested topsoil will be spoiled to prevent the spread of weeds within the project area. Dust suppression will be undertaken during construction to minimise adverse affects on surrounding vegetation.

On this basis it is considered that the EPA's objective of:

- maintaining the species abundance, diversity, geographic distribution and productivity of the vegetation, and protecting Declared Rare and Priority flora,

can be met by the proposal.

4.0 Terrestrial Fauna

4.1 Background and Methodology

The project area lies within the Dampier Land which consists primarily of low lying sandplains and dune fields over Jurassic sandstones. Pindan is common throughout the Dampier Land and contains few documented terrestrial vertebrate fauna species that are threatened or restricted to this particular habitat type.

A site visit was conducted over a two day period (11 and 12 November 1999) to describe and assess the fauna habitats within the project area. In addition, specific searches were made for the Schedule 1 fauna the Bilby *Macrotis lagotis* which had been recorded from the Crab Creek Road (Tim Willing CALM Broome, pers com. 1999). Opportunistic censusing of avifauna was undertaken along three transects which corresponded to the southern, middle and northern tracks traversing the project area and a fourth transect through burnt Pindan at the eastern end was also completed.

4.2 Fauna

4.2.1 Fauna Habitats

Land System mapping undertaken by CSIRO (1964) was used as the basis for habitat classification. Land Systems are "an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation" (CSIRO, 1964). The project area falls within the Yeeda Land System which covers approximately 15 798 km^2 of the West Kimberley. Within this Land System four Land Units are recognised: sand plain, shallow valleys, plains with a thin sand cover and pans (CSIRO, 1964). These land units coincide broadly with fauna habitat types. Only the sand plain unit occurs within the project area. This unit comprises 82% of the area of the Yeeda Land System and is vegetated with *Acacia* dominated Pindan.

Fauna of the project area is discussed in the broader context of the Dampier Peninsula which although part of the Canning Basin shares closer affinities with the North Kimberley in that it receives a relatively high and predictable rainfall (McKenzie, 1983). A detailed survey of the Peninsula was carried out by the then Department of Fisheries and Wildlife in the late 70's and Published in 1983 (McKenzie, 1983). This publication in conjunction with the annotated list of the Birds of Broome (Collins, 1995) comprise the most detailed accounts of the fauna of the region.

4.2.2 Avifauna

A total of 33 species of birds from 22 families were recorded during the survey. All have previously been recorded from the Pindan (Collins, 1995, Johnstone, 1983). The low number of species recorded from the project area reflects the small size of the project area, uniformity of habitat and that the survey was primarily designed to assess habitat types and search for evidence of rare species.

A comprehensive account of the avifauna of Broome is given by Collins (1995) and includes a large number of birds typical of the Pindan. The annotated list includes several Schedule and Priority species including the Peregrine Falcon *Falco peregrinus* (Schedule 4), Square-tailed Kite *Hamirostra isura* (Priority 4), Bush Stone-curlew *Burhinus grallarius* (Priority 4) and the Masked Owl *Tyto novaeseelandiae* (Priority 4). The list is exhaustive and includes many irruptive and vagrant species.

An account of the typical avifauna community of the Pindan is given by Johnstone (1983) who conducted a survey of the Dampier Land in 1977. During this survey Johnstone recorded 56 species from the Pindan comprising 31 non-passerines and 25 passerines. Although covering approximately 70% of the Peninsula, the Pindan supports relatively few sedentary species (Johnstone, 1983), with the great majority being nomads and breeding and non-breeding visitors. The sedentary species include the Rufous Whistler *Pachycephala rufiventris*, Grey Shrike-thrush *Colluricincla harmonica*, Grey-crowned Babbler *Pomatostomus temporalis*, Variegated Fairy-wren *Malurus lamberti*, Rufous Songlark *Cincloramphus mathewsi* and Singing Honeyeater *Meliphaga virescens*. There were a number of species recorded from the project area that Johnstone (1983) typically associates with the mixed *Eucalyptus* woodlands these included the Rainbow Lorikeet *Trichoglossus haematodus*, Boobook Owl *Ninox novaeseelandiae*, Blue-winged Kookaburra *Dacelo leachii* and Australian Sittella *Daphoenositta chrysoptera.*

4.2.3 Herpetofauna

Storr and Johnstone (1983) list 78 species from 47 genera and 14 families that have been recorded from the habitats of the Dampier Peninsula. A subset of this tally comprising approximately 40 species from nine families would be expected to occur on the Pindan habitat. The list includes several endemics or near endemics to the peninsula, *Lerista apoda*, *L. separanda*, *Vermicella minima* and *Diporiphora pindan*. One of these species *Vermicella minima* is a Priority 2 taxa (see section 4.3). In general the herpetofauna of the region is considered to be fairly depauperate owing to the insular nature of the peninsular and the lack of diversity of environments. This is compounded within the project area as just the one habitat, Pindan is present. As discussed this habitat is well represented in the region.

A search of the WA Museum database for specimens collected from the Dampier Peninsula is included in Appendix 7.

4.2.4 Mammalian Fauna

Like the herpetofauna the mammalian fauna of the peninsula is considered to be fairly depauperate when compared to the Phanerozoic South-West Kimberley district of which it is a part. Just 33 species have been recorded from the peninsula compared to 51 from the district since European Settlement (McKenzie, 1983). The mammalian fauna of the peninsula shows closer affinities to the North Kimberley sub-region than to the Great Sandy desert to the south which it abuts. The project area would be expected to support substantially fewer than the 33 species recorded from the peninsular owing to the fact that the Pindan was the only habitat evident. There are no mammals endemic to the peninsular. Similarly no evidence of the Bilby *Macrotis lagotis* was recorded from the project area (See Section 4.3).

The search of the WA Museum database listing the mammal species recorded from the peninsula is included in Appendix 7.

4.3 Threatened Fauna

Native fauna species which are rare, threatened with extinction or have high conservation value are specially protected by law under the *Western Australian Wildlife Conservation Act 1950.* In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan & Australia Migratory Bird Agreement (JAMBA) and the China & Australia Migratory Bird Agreement (CAMBA).

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 1998* recognises four distinct schedules of taxa:

- Schedule 1 taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;
- Schedule 2 taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;
- Schedule 3 taxa are birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction which are declared to be fauna in need of special protection; and
- Schedule 4 taxa are fauna that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, fauna are also classified under four different Priority codes:

Priority One Taxa with few, poorly known populations on threatened lands.

Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Two Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.

Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Three Taxa with several, poorly known populations, some on conservation lands.

Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four Taxa in need of monitoring.

Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.

A search of the CALM Threatened Fauna Database yielded two Scheduled taxa and one Priority taxa (see Appendix 7):

- Bilby *Macrotis lagotis* - Schedule 1 (Fauna which is rare or likely to become extinct). This species was last recorded within the general area of the proposed development in August 1970 and it is considered unlikely that the Bilby still persists this close to Broome. All recent records have come from an area 90 km NE of Broome along the Great Northern Highway.

- Peregrine Falcon *Falco peregrinus* - Schedule 4 (Fauna which is Otherwise Specially Protected). This species is likely to be an occasional visitor to the area. It is described as being scarce or rare in the Kimberley region (other than the hilly northwest where it is considered uncommon) (Johnstone and Storr, 1998).

- A burrowing snake *Vermicella minima* - Priority 2. According to CALM this species is restricted to the Dampier Land in the Kimberley with its range extending to an area slightly south of the Broome townsite.

In addition to the threatened fauna, one reptile species *Diporiphora pindan* is largely restricted to this habitat type. The preferred habitat of this species is pindan (*Acacia* thickets growing on red soils) of the Dampier Land and adjacent hinterland and coast.

No evidence of the occurrence of these species was recorded during the field fauna survey.

4.4 Migratory Birds

Roebuck Bay supports extensive areas of intertidal flats and beaches which comprise the landfall and feeding resources for large numbers of international migratory birds (Tulp and de Goeij, 1994). A wide range of species utilise the Roebuck Bay area and it has been estimated that up to 850 000 waders of 44 different species utilise the Bay and Eighty Mile Beach during migratory periods (Watkins, 1993; Keneally, et al., 1997). Roebuck Bay has been identified as an internationally important site for 19 of these species (Watkins, 1993). Amongst these 19 species of waders, the most abundant at Roebuck Bay include the Bar-tailed Godwit *Limosa lapponica* (up to 65 000 individuals), the Large Sand Plover *Charadrius leschenaultii* (up to 26 900) and the Great Knot *Calidris tenuirostris* (22 600) (Watkins, 1993).

The majority of arrivals from the northern hemisphere occurs during the period of August – September, with departures during the following March – April (Collins, 1995). A smaller proportion of these waders, particularly first and second year juveniles, remain resident in the area throughout the year. The timing of the departures for the majority of the migratory birds is well defined and usually occurs over a period of about 3 weeks in March – April, with most departures taking place in the two to three hours before dusk (Chris Hassell, pers. com., 2000).

The Roebuck Bay area is recognised as being of international importance and is subject to three international treaties based on its importance to migratory waders. These are:

- Ramsar (The Ramsar Convention which identifies wetlands of international significance) (see Figures 4.1 and 4.2);
- JAMBA (Japan – Australia Migratory Bird Agreement); and
- CAMBA (China – Australia Migratory Bird Agreement).

The latter two treaties recognise that the principal flight paths of migratory birds returning to the northern hemisphere take them through eastern Asia where a number of feeding / rest stops are necessary (Collins, 1995).

The proposed relocation site for the Broome airport is located approximately 8 km to the north of high tide roosting areas of migratory shore birds on the eastern end of the northern shores of Roebuck Bay.

Discussions were conducted with the staff of the Broome Bird Observatory and a range of specialist ornithologists as part of the community consultation process for the project (see Section 1.6) and the subsequent preparation of this PER. This identified that there was generally a lack of definitive knowledge regarding the flight paths followed by migratory birds when leaving from and arriving at Roebuck Bay.

4.5 Potential Impacts and Their Management

4.5.1 General Vertebrate Fauna and Threatened Fauna Impacts

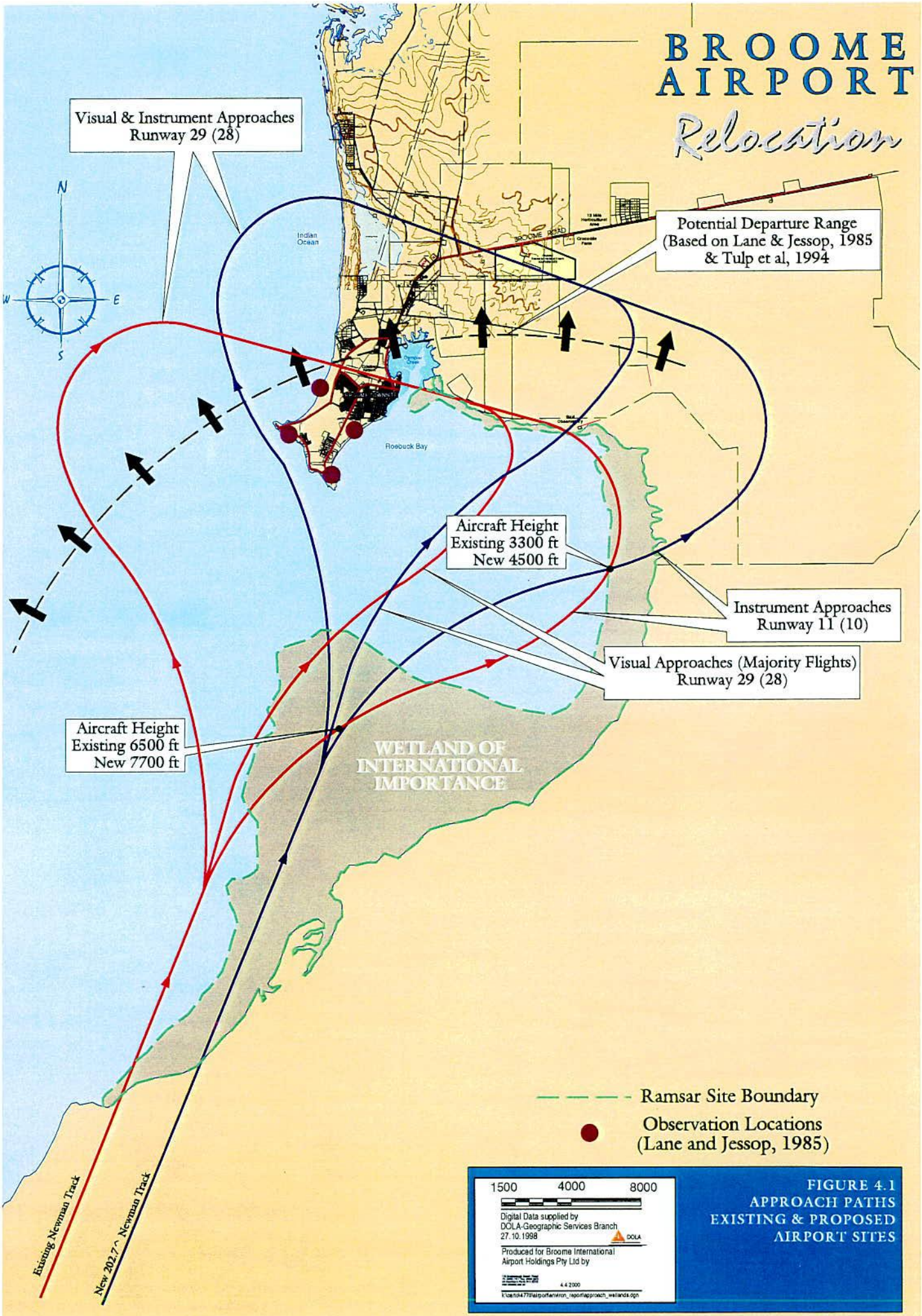
Potential impacts on fauna relate to the clearing of vegetation and the need to effectively rehabilitate areas following construction that are no longer required for the safe operation of the airport. There are no known species of threatened fauna that occur in the project area and it is considered unlikely that the habitats to be affected by the proposal support such species.

Potential impacts related to habitat clearing will be effectively managed by the same management controls to be applied to vegetation clearance (see Section 3.5). In addition, construction and operations personnel will be prohibited from bringing firearms or pets into the project area.

4.5.2 Migratory Bird Impacts

The proposed airport is approximately eight kilometres north of the shores of Roebuck Bay compared to the existing site which is situated virtually on the edge of Roebuck Bay (see Figures 2.2 and 2.3). The current airport landing strip is actually submerged at high tides by tidal waters from Dampier Creek which drains directly into Roebuck Bay.

Proposed flight paths from the new airport site have less overlap with the shores of Roebuck Bay than those from the existing site and aircraft will be at a significantly higher altitude in the vicinity of the coast (up to 4,500 ft on proposed tracks compared to around 3,300 ft for current flight paths over Roebuck Bay) (see Figures 4.1 and 4.2).


BROOME AIRPORT
Relocation
Visual & Instrument Approaches
Runway 29 (28)
Potential Departure Range
(Based on Lane & Jessop, 1985
& Tulp et al, 1994
Aircraft Height
Existing 3300 ft
New 4500 ft
Instrument Approaches
Runway 11 (10)
Visual Approaches (Majority Flights)
Runway 29 (28)
Aircraft Height
Existing 6500 ft
New 7700 ft
WETLAND OF
INTERNATIONAL
IMPORTANCE
Indian Ocean
Roebuck Bay
BROOME ROAD
N
S
E
W
Existing Newman Track
New 202.7° Newman Track
Ramsar Site Boundary
Observation Locations
(Lane and Jessop, 1985)
1500
4000
8000
Digital Data supplied by
DOLA-Geographic Services Branch
27.10.1998
DOLA
Produced for Broome International
Airport Holdings Pty Ltd by
4.4.2000
FIGURE 4.1
APPROACH PATHS
EXISTING & PROPOSED
AIRPORT SITES

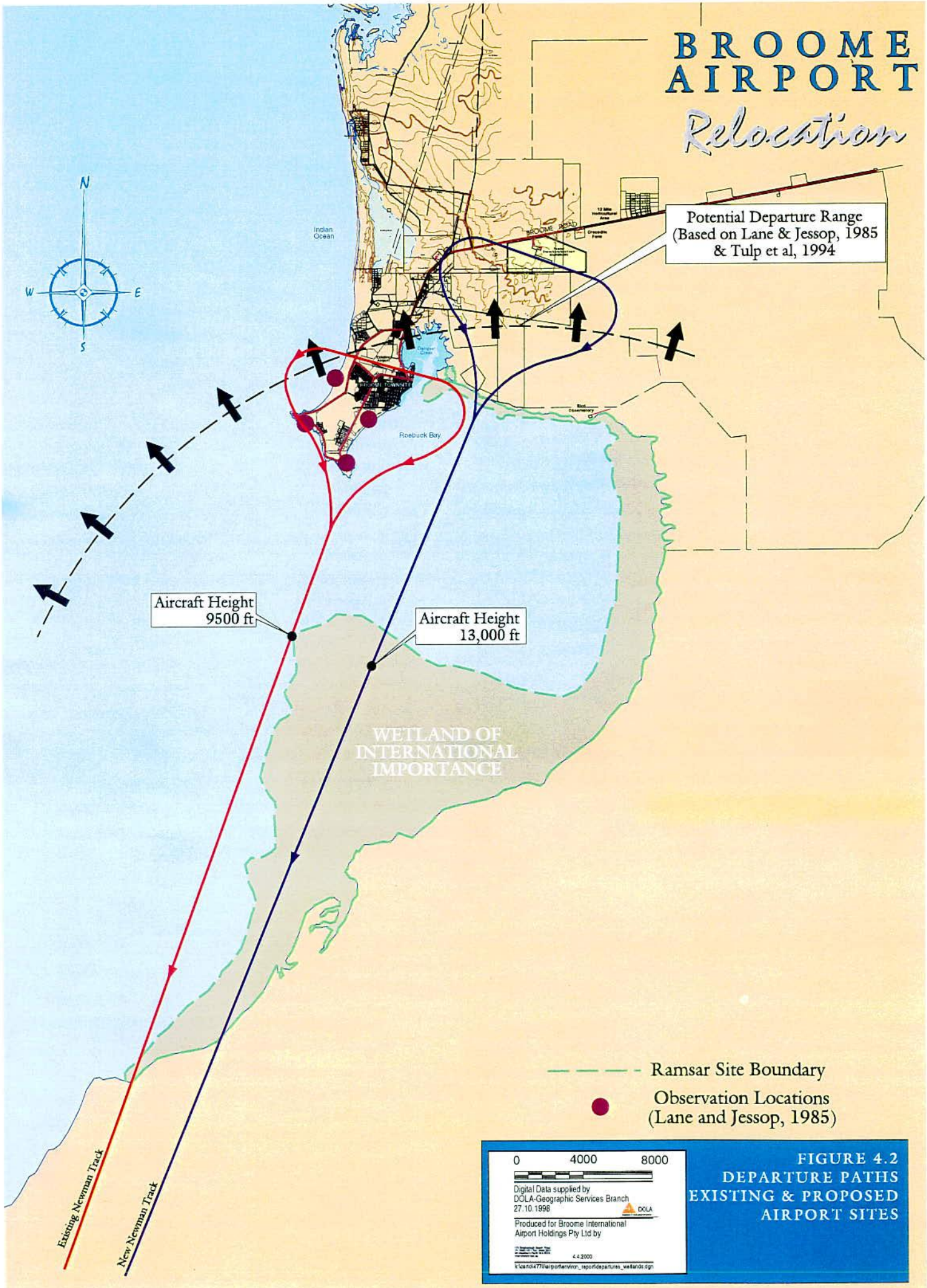


FIGURE 4.2
DEPARTURE PATHS
EXISTING & PROPOSED
AIRPORT SITES

Currently, a significant proportion of flights approach or depart the Broome airport from the vicinity of the Broome Bird Observatory and track over and along the coast of Roebuck Bay (see Figures 4.1 and 4.2). With the new proposed flight paths, flights that interface with this area (those arriving from Perth), will cross the coast in a perpendicular fashion with a significantly reduced interface with the Roebuck Bay coastal zone (see Figures 4.1 and 4.2). It should be noted however, that the flight paths shown on these Figures are what are termed 'instrument approaches'. Pilots approaching the airport may not follow these paths dependent on weather conditions or other considerations.

Further consultation was undertaken with a range of specialists on migratory birds to supplement this preliminary analysis of the change in airport location and flight paths. This included discussions with specialists from the WA Museum, the Broome Bird Observatory and the Department of Conservation and Land Management's wildlife research centre. These discussions identified that there is limited published information from Broome that attempts to quantify the departure paths and flight altitudes of migratory birds in the vicinity of Roebuck Bay. Two studies have been carried out using field observations and radar tracking (Lane and Jessop, 1985, Tulp et al, 1994), and there are extensive anecdotal accounts and unpublished information held in the Broome Bird Observatory.

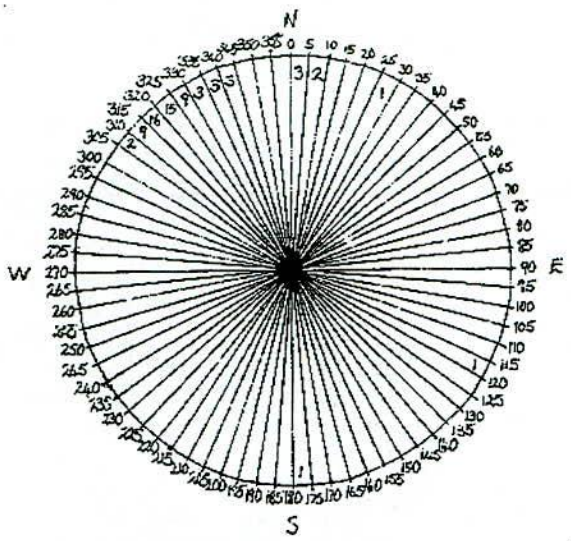
According to Lane and Jessop (1985), the majority of migratory bird departures from Roebuck Bay were on bearing between 305° and 345° (i.e. on generally north-westerly headings) (see Figure 4.3). This study also identified that the greatest proportion of departures occurred during March-April, when skies were clear with moderate easterly to south-easterly winds. Much less migration occurred under overcast conditions with winds from other directions (Lane and Jessop, 1985).

Similar directional data arose from the radar tracking and field studies carried out by Tulp et al (1994). This study found that departures occurred between 280° and 20°, with a mean of 341° based on radar and 329° based on field observation (see Figure 4.3). These findings were reasonably consistent with the Lane and Jessop (1985) study. The Tulp et al (1994) study also found that the highest intensity of departures occurred in the 2-3 hours prior to sunset, and that departures occurred most often on rising tides.

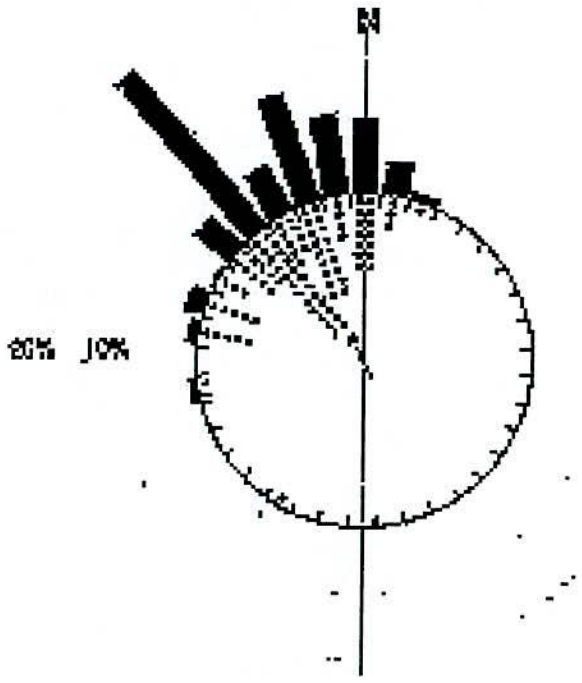
Both studies indicated a proportion of departures to due north from Roebuck Bay. Records and anecdotal accounts from the Broome Bird Observatory are consistent with this, including accounts of small to large flocks (hundreds of birds) departing due north over the observatory.

Based on the above information, and consultation with several migratory wader specialists (C. Hassell; G. Pearson; R. Johnstone; P. Battely, pers. com., 2000), it appears that bird departures occur across a range of bearings from north-west to due north. This would include direct overflights of both the proposed airport site and the existing site (see Figures 4.1 and 4.2). To add to the available information, the proponent has commissioned a migratory bird watch study that is currently being carried out. This entails skilled watchers situated at several locations along the northern margin of Roebuck Bay, including a point due south of the proposed airport site and a location adjacent to the existing airport site. Data collected will include bearing, number of individuals and species. It is important to note that this will represent a single year's data only and will not provide definitive guidance as to the departure characteristics of migratory bird flocks from Roebuck Bay.

Figure 4.3: Migratory bird departure bearings based on



(a) Lane and Jessop (1985); and



(b) Tulp et al (1994)

Migratory bird elevations also need to be considered in evaluating risk of bird strike. According to Lane and Jessop (1985) and the WA Museum (R. Johnstone, pers. comm., 2000), the maximum altitude that migratory birds are likely to attain is in the order of 1 000 m (approximately 3 200 ft). However, only certain bird species attain such heights and in the vicinity of the coast, such as around the Broome area, the majority of migratory bird species are likely to fly far closer to the ground (R. Johnstone and C. Hassell pers. comm., 2000). Tulp et al (1994), however, detected flocks at a maximum height of 1 600 m at distances up to 20 km from Broome. When these heights are compared to the heights of aircraft over Roebuck Bay, it can be seen that proposed aircraft flight paths will represent a considerable increase in elevation over the existing over Roebuck Bay itself (see Figures 4.1 and 4.2).

However, in the area north of Roebuck Bay surrounding the proposed airport, aircraft elevations will be within the range of flying heights of migratory birds. As a proportion of departures will overfly this area (see Figures 4.1 and 4.2), there will be a risk of bird strike occurring. It is important to note that this is also the case at the current airport site, which has a history of relatively few bird strikes (see Section 9.0). A comprehensive analysis of bird strike risk has been completed and is presented in Section 9.0.

The current location of the airport is immediately adjacent to the intertidal habitats of Dampier Creek and Roebuck Bay. This often means that intertidal waders must be dispersed from the landing strip with bird-scare shot prior to flight arrivals. This aspect of the risk of bird strike will be largely eliminated with the relocation of the airport to the proposed site as it is several kilometres inland and well removed from the intertidal areas the airport currently affects. In addition, potential hydrocarbon spills and fuel dumping at the existing airport site poses far greater risk to Roebuck Bay than the proposed site. At the existing site, fuel spills would be virtually on the shores of Dampier Creek and disperse directly into Roebuck Bay. With the new site, there is a separation of approximately 8 km from Roebuck Bay at the closest point and any hydrocarbon spills would be the subject of a contingency and cleanup plan (see Section 6.0). It is considered highly unlikely that a hydrocarbon spill at the proposed airport site would be left untreated long enough to contaminate groundwater to the extent that it would have any detectable effect on Roebuck Bay.

This is a significant benefit arising from the proposal, as prevention of contamination risk to the benthic infauna is fundamental to ensuring the continued value of the site to migratory waders (Tulp and de Goeij, 1994; G. Pearson, pers. com., 2000).

Bird strikes at the existing airport are a recognised hazard, particularly at the commencement of the wet season. Pilots are made aware of the bird hazard via notices in the Airservices Australia pilots publication Enroute Supplement Australia (ERSA). The airport owners also have additional on the ground measures in place to minimise bird strike. This includes regular checks, drainage and rubbish control, bird harassment, and participation in the Airservices Australia bird reporting programme. These procedures will be maintained with the relocated airport. It should be noted however, that even at the existing site, the actual incidence of bird strikes is very small (see Section 9.0). All bird strikes reported to the airport to date have been at an altitude of less than 20 m AGL (Above Ground Level).

The proponent will maintain liaison with the Broome Bird Observatory to take account of the outcomes of ongoing studies in the future planning and management of the operation of the relocated airport. On the basis of the available information, it is difficult to predict whether the proposed flight paths for aircraft from the new airport site will result in a reduced or increased risk of migratory bird strikes. However, it is reasonably clear that the relocation will result in a reduced level of disturbance to the Roebuck Bay shorebird habitats in general, and a reduced contamination risk, compared to those of the current airport location.

As migratory bird departure occurs within defined conditions in respect of date, time of day, tide and weather conditions (Tulp et al. (1994); Chris Hassell, pers. com. (2000)), it is possible to assign risk levels to particular departure times. The great majority of departures, and thereby the risk of either birdstrike impacts to planes or aircraft disturbance of migrating birds, can be reliably restricted to a three week period of the year and to the two to three hours prior to dusk on those days.

The proponent, therefore considers bird strike risk an aviation issue and will implement aviation management, consistent with industry practice, taking these parameters and any reliable data arising from the migratory watch into account.

4.6 Outcomes and EPA Objectives

The vertebrate fauna known from the site are widespread in the region and are considered to have no special conservation significance. No Threatened fauna are known to occur in the site or were recorded during field surveys. The extent of habitat that will be lost due to the project is negligible compared to the distribution of the habitat type in the region. Controls will be placed on construction and operational personnel to reduce collateral impacts to local fauna.

A risk of bird strike exists at the current airport site. The proposed site for the airport will still represent a risk of strikes with migratory birds, but the proponent considers this manageable by standard aviation practices. BIAH will take account of any ongoing studies by the Broome Bird Observatory on migratory routes and timing in the ongoing management of the facility.

On this basis, and given the environmental management committed to by the proponent, it is considered that the EPA's objective of:

- maintaining the species abundance, diversity, geographic distribution and productivity of fauna;
- protecting Threatened and Priority fauna; and
- avoiding impacts on migratory birds or their habitat,

can be met by the proposal.

5.0 Landforms and Visual Amenity

5.1 Background and Methodology

The project area lies within the Dampier Peninsula which consists primarily of low lying sandplains and dune fields over Jurassic sandstones (Keneally, et al., 1997). In general terms, the site is situated in an undulating and very homogeneous landscape.

Landforms were assessed from aerial photography, site inspection and a review of available geological and geomorphological mapping and literature.

5.2 Landforms and Visual Environment

The preferred site is situated on a Pindan sandplain to the north east of the townsite of Broome (see Figure 1.1). The soils of the site are Pindan, characterised as red loam soils which are poor in nutrients and of aeolian (wind driven) origin (Keneally et al., 1996). The site has a gentle fall from north to south. A number of sand ridges up to 4 m to 5 m high cross the site but a largely level site has been identified for the main runway. With the exception of these dune ridges, the majority of the site is relatively level, ranging from 28 to 29.5 m AHD.

A visual assessment of the site was conducted by Landvision (1999):

'As you arrive at Broome by road you have a view from about 15 kms out, over the pindan plateau and mangroves of Dampier Creek to Broome and coastal dunes. In the foreground of this view is the proposed site gently sloping to the west and south. The area is moderately vegetated with Pindan vegetation and has a red sandy surface typical of the surrounding region.'

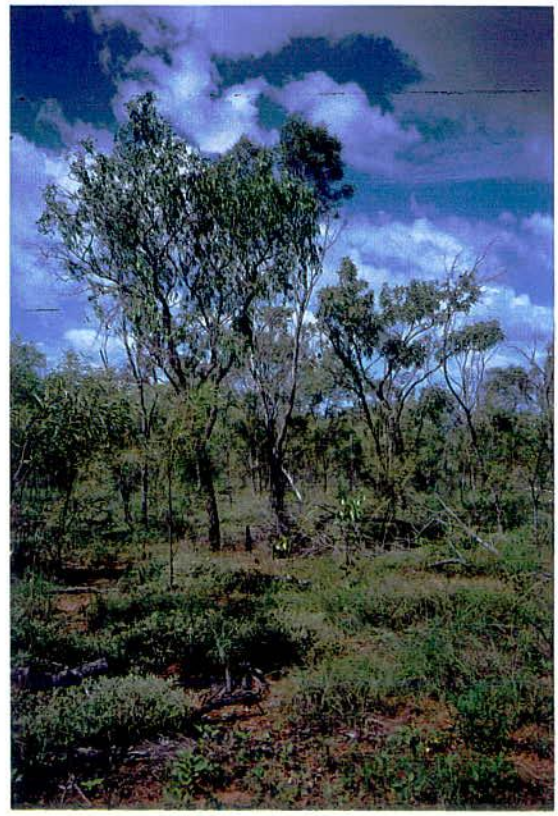
Representative photographs of the site are provided in Plate 1, whilst Figure 2.1 provides an aerial photograph overlain with the conceptual development boundaries of the proposed airport site.

5.3 Potential Impacts and Their Management

Potential impacts related to landforms and visual elements in the area include:

- direct impacts on existing landforms from earthworks activities;
- earthworks required to construct the new airport will result in an interface between existing landforms and the works area. This may result in the creation of unstable landforms or erosive drainage processes; and
- the new airport site may cause visual impact to a setting that is currently natural bushland only. The key viewshed in this respect is from Broome Road.

The proposal will result in some levelling of existing sand ridge landforms to enable construction of the airport, and associated accesses and ancillary infrastructure. However, the preferred site has been located on a level area which will result in minimal impact on these landform elements. The majority of the sand ridges on the site will remain undisturbed and these landform features are the dominant landform feature present in the entire Dampier peninsula and have little special significance.



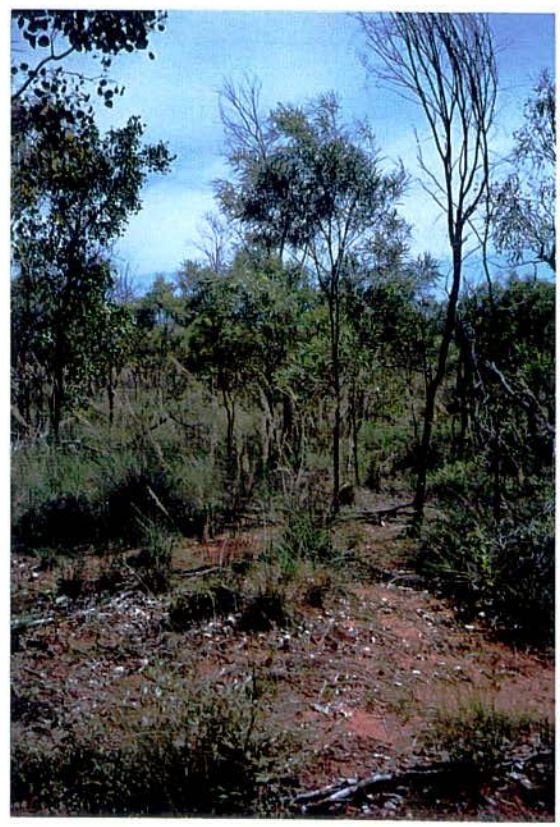


Plate 1: Representative Pindan Vegetation from the proposed site for the relocation of Broome International Airport.

Halpern Glick Maunsell

Consulting Engineers and Environmental Scientists

HGM

Construction management controls will be placed on all ground clearing activities which may affect existing landforms. The detailed design of final earthworks will make provision for appropriate drainage and interface treatments to ensure that the site blends in with existing landscape and that drainage is appropriately managed. A Drainage Management Plan will be prepared and implemented as part of the final design of the site to ensure that erosion from run off does not result in impacts of landforms that interface with and surround the site (see Section 6.3).

The main viewshed that may be affected by the proposed development is that observed from the Broome Road. The vegetation in the area is relatively dense pindan and the site under consideration for the terminal will be set back a considerable distance from the road (see Figure 2.1 and Plate 1). In addition, the runway and most other structures will be relatively low in the landscape and unlikely to cause substantial visual impact. The control tower building will be centrally located in the terminal complex and will be no higher than a two storey building (approximately 10-12 m). This building, and the majority of the airport site, will be largely screened from Broome Road by a buffer of remnant vegetation to be retained between the airport and the road. The proponent will also maximise the retention of significant trees in the final design of the relocated airport for their landscape and habitat values (see Section 9.0). This will be carried out as part of a Landscape Management Plan to be prepared as part of the final design of the airport (See Section 9.0). The proposed airport relocation site is also sufficiently removed from the nearest residences that any light spill and other visual impacts will not have any adverse impacts.

5.4 Outcomes and EPA Objectives

The landforms that will be affected by the proposed airport relocation are widespread in the Broome region and not of any particular significance. Final detailed design of earthworks will make provision for appropriate drainage and interface treatments to ensure that the site blends in with existing landscape and that drainage is appropriately managed. The final site will be largely screened from the Broome Road by vegetation and should result in minimal alteration to visual amenity in the area. A Landscape Management Plan will be prepared and implemented as part of the final design of the airport.

On this basis, and given the environmental management committed to by the proponent, it is considered that the EPA's objectives of:

- establishing stable, sustainable landforms consistent with the surroundings; and

- ensuring that the visual amenity of the adjacent area should not be unduly affected,

can be met by the proposal.

6.0 Surface and Groundwater Quality

6.1 Background and Methodology

The proposed airport site is situated within the Broome Groundwater Area. This Area was proclaimed in 1974 and has subsequently been extended to now cover an area of 175,473 ha. The southern limit of the Groundwater Area is marked by the southern limit of the Broome peninsula. From here, the Groundwater Area extends approximately 57 km northwards along the coast and approximately 35 km to the east.

The 1991 Broome Groundwater Management Plan divided the Groundwater Area into seven sub areas (Water Authority, 1994). One of these, Town Water Reserve, is now coincident with Broome Water Reserve 25716. This Reserve covers 16,370 ha and provides protection for proposed wellfield extensions.

The preferred location for the airport overlies the southern portion of the Broome Water Reserve, to the south of Broome Road. A stock watering point (windmill) located in this area will ultimately be removed. The Water Corporation has indicated that this southern portion of the Water Reserve will be excised to allow development of the relocated airport.

6.2 Existing Hydrological Regime

Water supply for the town of Broome is obtained from the Broome Sandstone Aquifer. This base of the aquifer is up to 200 m below sea level with a groundwater level of between 3 m and 8 m AHD. Groundwater levels fall from east to west across the site.

With respect to groundwater quality, salinity levels are in the range of 145 to 2000 mg/L. Local groundwater is dominated by sodium and chloride ions, has low levels of carbonate, sulphate, iron and manganese, and high silica content, often in excess of 80 mg/L TDS.

Surface drainage patterns within the study area are poorly developed and there are no significant drainages entering or leaving the site. Under most circumstances rainfall either infiltrates to the underlying superficial aquifers (only a small percentage), is transpired from the soil profile by xerophytic vegetation or is evaporated directly from the soil. Broome Road to the north of the site acts as an artificial catchment boundary and only during significant cyclonic and tropical downpours does significant surface run off generally occur.

6.3 Potential Impacts and Their Management

Given that the proposed airport will be down gradient of the production bores located in the Broome Water Reserve, there is unlikely to be any impact from the development on groundwater quantity or quality extracted from this borefield. Concern has also been raised that continued water use at the existing airport site may cause the fresh / saline groundwater interface to move inland. Relocation of the Broome airport to the proposed site will reduce the potential for this to occur. The new location would also reduce the risk of any spillages entering natural receiving bodies compared to the current airport location adjacent to Dampier Creek.

Other groundwater and surface water management issues that need to be addressed as part of this development include:

- treatment and disposal of sewage;
- treatment and disposal of aircraft waste liquid;
- handling of solid waste;
- fuel storage and management;
- mobilisation of contaminants in surface flow during rainfall events; and
- water supply requirements.

These are described in more detail below.

- **Treatment and Disposal of Sewage**

Sewage will be generated from public and staff facilities servicing the airport. This will be treated and disposed of on-site in a sewerage system to be designed in accordance with Health Department and Water and Rivers Commission requirements. The final design of this system is yet to be determined but it is likely to consist of aerated treatment units or a similar system. No industrial wastes will be discharged into the sewerage system.

- **Treatment and Disposal of Aircraft Wastes**

This waste stream consists of the sanitary wastes that periodically need to be removed from the aircraft. Waste materials will be collected and confined to the proposed airport sewerage system. Again, the requirements of the Health Department will be met in this regard, particularly with respect to any potential pathogens that may be introduced from international flights.

- **Handling of Solid Waste**

Solid waste will be collected and temporarily stored in on-site storage bins prior to removal by licensed contractor to the Shire of Broome Waste Disposal site. Handling, transport and ultimate disposal will be in accordance with the requirements of the Shire of Broome.

- **Hydrocarbon Storage and Management**

Hydrocarbon storage will be required on-site for aviation fuel, diesel/petrol for service vehicles and oils and greases for minor servicing.

Fuel will be stored in above-ground tanks located on impermeable concrete foundations and within a bunded containment area. The facility will be designed and operated in accordance with Department of Minerals and Energy and Commonwealth Airports Corporation requirements. Lubricants will also be stored within the containment facility. All refuelling will be undertaken on hardstand areas only by equipment fitted with automatic shut-off valves that will be manned at all times whilst in use.

A specific spillage response plan will be developed as part of the EMP for the airport to address any spills (see Section 10.0). Any spills of hydrocarbons or other potential groundwater contaminants will be immediately cleaned up by:

- placement of appropriate absorbent material over the spillage; and
- excavation of contaminated material and removal of this material offsite by a licensed contractor.

Any significant spills will be reported to the Water and Rivers Commission, DEP and the Shire of Broome. Waste hydrocarbons will be removed offsite by a licensed contractor and disposed of in accordance with Shire of Broome requirements.

- **Surface Drainage Management**

The creation of a new runway, taxi-way, aprons, car parking and buildings will lead to a localised reduction in rainfall infiltration and an increase in storm water surface run-off volumes. Run off originating from hardstand areas will be directed into perimeter swales connecting to existing overland flow paths both within and beyond the airport boundary. The swales will be constructed with baffles to slow the movement of water and to encourage infiltration and local recharge through the free draining soils. Under normal rainfall events it is expected that most of the water collected will infiltrate and it would only be during significant tropical or cyclonic downpours that off-site discharge would occur.

Any gross contaminants released from hardstand areas are expected to be retained by the swales. Following infiltration of water these contaminants would be trapped by the upper soil profile, providing an opportunity for contaminated material to be removed on a periodic basis. This would be achieved by physical removal by an excavator or similar, with subsequent disposal at an approved site in accordance with the requirements of the Shire of Broome.

Whilst drainage management for the project will be based on the principles outlined above, the detailed design will be the subject of a Drainage Management Plan to be prepared by the proponent to the satisfaction of the Water and Rivers Commission (see Section 9.0). Issues including the use of lined drainage basins and the preparation of a spill contingency plan will be addressed in the Drainage Management Plan.

- **Water Supply**

The proposed site is too far removed from the Broome town site to be serviced by mains water. A dedicated system of bores (duty and standby) will be installed on-site to service the airport. Water will be sourced from the Broome Sandstone Aquifer in the same way as the current town supply. Based on current project planning, it is estimated that approximately 75 m^3 of water per average day (27 000 m^3 per annum) could be extracted for the airport's requirements. Licences will be sought by the proponent from Water and Rivers Commission for these bores as appropriate.

6.4 Outcomes and EPA Objectives

Given the management measures committed to by the proponent, including the development and implementation of a detailed Drainage Management Plan to the satisfaction of the Water and Rivers Commission, it is considered that the EPA's objective of:

- maintaining or improving the quality of groundwater and surface water to ensure that existing uses, including ecosystem maintenance, are protected, consistent with the draft Guidelines for Fresh and Marine Waters;

can be met by the proposal.

7.0 Noise

7.1 Background

The assessment of potential noise impacts is typically a key issue for the construction, relocation or expansion of airport facilities. In the case of the Broome International Airport, the facility is currently located within the Broome town site. The proposed relocation will result in the airport being separated from the town, and therefore the great majority of noise sensitive receivers, by approximately 12 km. The preferred southern option was settled on after taking account of potential noise impacts, and final flight paths were modified to reduce potential impacts on residential areas such as Coconut Wells (see Section 1.6; Appendix 3).

A detailed flight forecasting and noise modelling exercise was carried out for the proposed airport relocation by Kubu Australia Pty Ltd. This is presented in Appendix 3.

7.2 Airport Noise Measurement and Prediction

The Australian Standard 2021-1994 (Acoustics Aircraft Noise Intrusion - Building Siting and Construction) provides guidance to regional and local authorities, organizations and others associated with urban and regional planning and building production on the location and construction of new buildings and on the acoustic adequacy of existing buildings in areas near aerodromes. The Standard includes guidelines for the assessment of potential aircraft noise exposure at a given site, which are based on the Australian Noise Exposure Forecast (ANEF) system. The Standard could also be used to assess the noise impact of a new aerodrome or of altering an existing one.

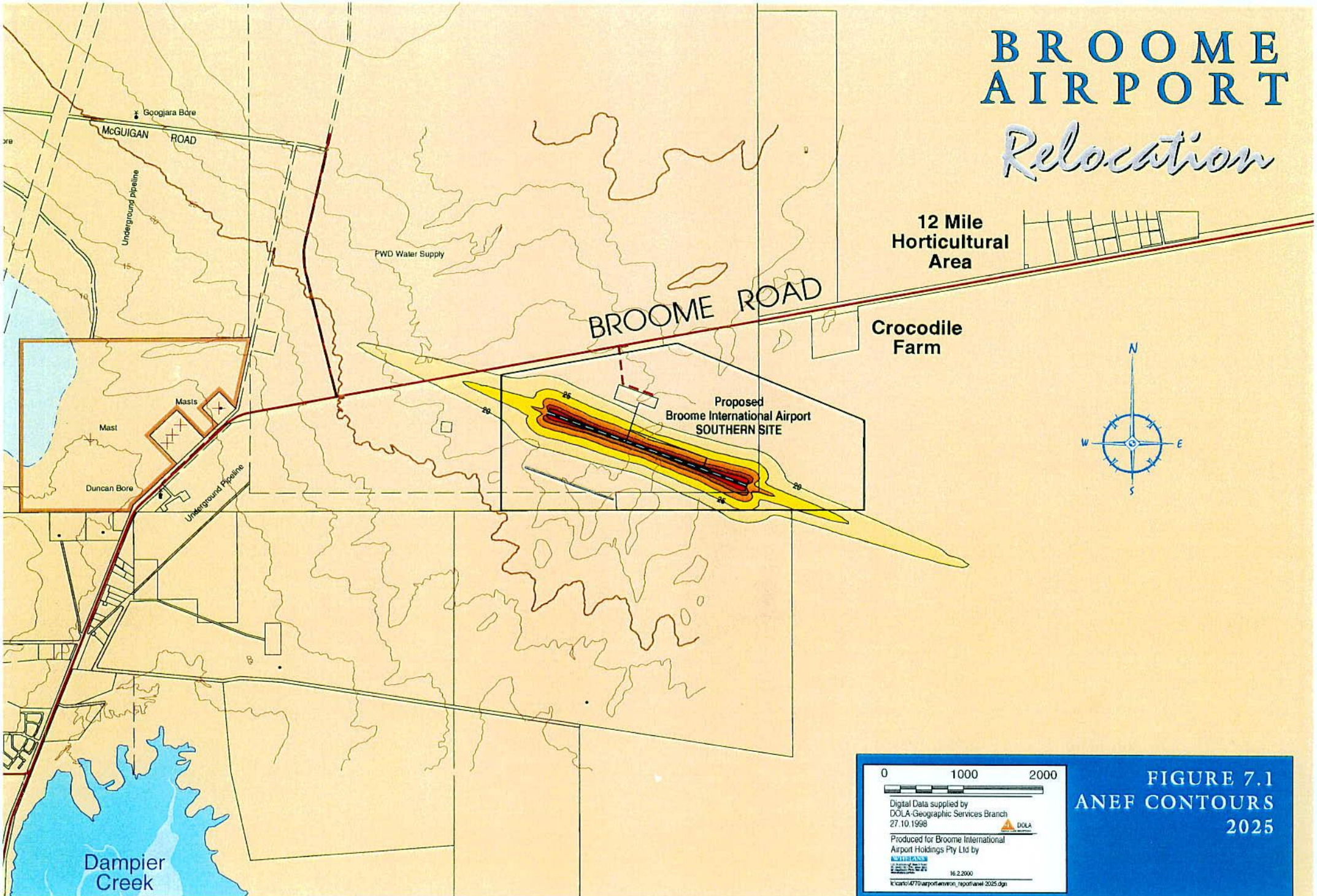
The Australian Noise Exposure Forecast (ANEF) system provides a single number index for predicting the cumulative exposure to aircraft noise in communities near aerodromes during a specified time period. There are three different types of aircraft noise contour charts produced using the ANEF system. All three charts are prepared using the same computational procedures. These are described below.

- Australia Noise Exposure Forecast which indicates the anticipated noise contours that will exist in a future year, generally 10 years from the date of issue. It will have been subjected to review by relevant authorities before release and the chart will display the official endorsement of the Civil Aviation Authority.

- Australia Noise Exposure Concept (ANEC) is a noise contour map which has been produced during planning for aerodrome development. It is based on a proposed set of conditions of runways, aircraft types and so on.

- Australian Noise Exposure Forecast (ANEI) which calculates the actual noise exposure for some previous time period, generally a year.

The ANEF system was used to determine noise exposure at Broome, and a chart of ANEF contours was produced for planning for the year 2025 (Figure 7.1). This is a series of contours which provide anticipated boundaries for various noise exposure levels around the airport.


BROOME AIRPORT
Relocation
Googjara Bore
McGUIGAN ROAD
Underground pipeline
PWD Water Supply
BROOME ROAD
12 Mile Horticultural Area
Crocodile Farm
Masts
Mast
Duncan Bore
Underground Pipeline
Proposed Broome International Airport SOUTHERN SITE
25
29
N
W
E
S
Dampier Creek
0
1000
2000
Digital Data supplied by DOLA-Geographic Services Branch 27.10.1998
Produced for Broome International Airport Holdings Pty Ltd by
16.2.2000
FIGURE 7.1
ANEF CONTOURS 2025

An issue to be aware of relates to the interpretation of sets of ANEF contours. Aircraft noise does not cease at the edge of a noise contour - it is just less than the amount the contour represents. Anywhere within a 20 to 30 km radius of the airport can expect, on occasions, to be overflown by aircraft and thus be subject to some level of aircraft noise. The majority of aircraft follow regular flight patterns but for a variety of reasons aircraft can some times be diverted from their usual path.

7.3 Methodology

The ANEF contours were overlaid on the proposed runway layouts for the airport in order to assess the areas affected by aircraft noise (see Section 2.2 for proposed airport configuration). The single main runway as planned will take both departing and arriving aircraft, and operations in either direction are possible depending on wind direction and strength. The runway is aligned approximately 110 degrees magnetic, and so is referred to as the 11/29 runway. Operation on the 11 runway means an operation heading Easterly (110 degrees), and operation on the 29 direction means an operation heading Westerly (290 degrees).

Predictions of aircraft noise were based on outputs from the FAA Integrated Noise Model (INM). This computer programme produces various measures of noise, and has been modified to suit the methodology for producing the Australian noise exposure indicators.

The following assumptions were made in the flight and noise forecasting study:

- arrivals and departures comprised 50% each of the traffic
- runway length is 2 700 metres
- runway 29 movements comprise 60% of the traffic
- runway 11 movements comprise 40% of the traffic
- turn radius for jet aircraft is 7.4 km (approx. 4.5 nm)
- turn radius for turboprop aircraft is 5 km (approx. 3.0 nm)
- turn radius for general aviation aircraft is 1 km (approx. 0.6 nm)

The Runways and Flight Tracks were created in INM (see Appendix 3 - Figures 1 and 2 for the approaches and departures for each runway end). The traffic was then apportioned by Runway, Track and Profile and the INM Flight Timetables were created for the years 1999, 2010 and 2025. This enabled the departing aircraft volumes, of all types, to be determined for these years. As aircraft noise is considered to be greater for departing than arriving aircraft, the aircraft departure volumes for 1999, 2010 and 2025 have been illustrated on Figures 3, 4 and 5 of Appendix 3. Noise contours were generated and plotted using the Integrated Noise Model Version 5.2 with the ANEF metric (see Appendix 3).

7.4 Potential Impacts and Their Management

For the new Broome International Airport, the 1999 (present traffic) ANEF and the ANEF for the years 2010 and 2025 were determined to enable a comparison to be made between present and future noise levels (see Figure 6,7 and 8 of Appendix 3). ANEF contours for the year 2025, the maximum number of aircraft movements modelled for the proposed site, are shown in Figure 7.1.

The ANEF noise contours are fairly independent of the flight paths used in the modelling, because the noise from aircraft operations at Broome attenuates rapidly with increasing distance from the runway. Although the Standard notes that the actual location of the 20 ANEF contour is difficult to define accurately because of variations in aircraft flight paths, pilot operating techniques and the effect of meteorological conditions on noise propagation, this is not considered a problem at Broome. The standard departure and approach flight paths (DAPS) which have been developed for the new airport at Broome will allow aircraft turns only outside the ANEF 20 contour. DAPS are controlled by AirServices Australia and all aircraft are required to follow those procedures. In addition, the DAPS for the new airport will cause arriving and departing aircraft to be routed away from the Broome town and other built up areas.

The noise affected areas are to the north west and south east of runway 11/29. For scenarios based on current flight volumes, these noise affected areas are contained almost entirely within the airport boundary (see Appendix 3). The ANEF 30 contour is contained within the airport boundary for all forecasts. The ANEF 20 contour is almost completely within the airport boundary for the 1999 forecast, and extends approximately 1.5 km beyond the airport boundary for the 2025 forecast (see Figure 7.1). It is important to note that within this 20 ANEF contour, the land is presently undeveloped and uninhabited. There are no buildings or residents within the 20 ANEF contour for any of the forecast periods (see also Figure 2.1).

The noise forecast is expected to be reasonably robust with respect to changing aircraft type. There have been significant improvements in noise control technology for the latest generation aircraft, and new aircraft must conform to stringent noise controls. This means that all future replacement aircraft types of a given size (and thus engine capacity) are likely to have similar noise signatures compared to other aircraft of the same size. Thus replacement of one type of medium jet such as A320 by another type of medium jet such as a Boeing 737-800 is not likely to have an impact on forecast noise, assuming that the frequency of movements remains the same (see also Section 2.4).

Whilst the modelling of noise levels indicates no impacts on existing receivers, future land use planning adjacent to the proposed Broome International airport site needs to be in accordance with the relevant Australian Standard A2021 - 1994.

The landuse planning in the vicinity of the proposed airport site has been included in a study undertaken by the Waterbank Station Co-ordinating Committee which comprises the following agencies:

- Department of Land Administration;
- Shire of Broome;
- Kimberly Land Council;
- Minister of the Premier and Cabinet;
- Department of Conservation and land Management;
- Ministry for Planning; and
- Kimberley Development Commission.

The purpose of the study was to prepare a structure plan proposing potential land-use that will accommodate the future expansion of the Broome townsite including a suitable site for the relocation of the Broome airport. The proposed Waterbank Structure Plan is shown in Figure 7.2. The proposed land uses surrounding the airport site identified in Figure 7.2 are the water resource reserve, industrial and pastoral lease. These land uses are considered to be compatible with the airport development. The Waterbank Structure Plan is currently before Government for adoption.

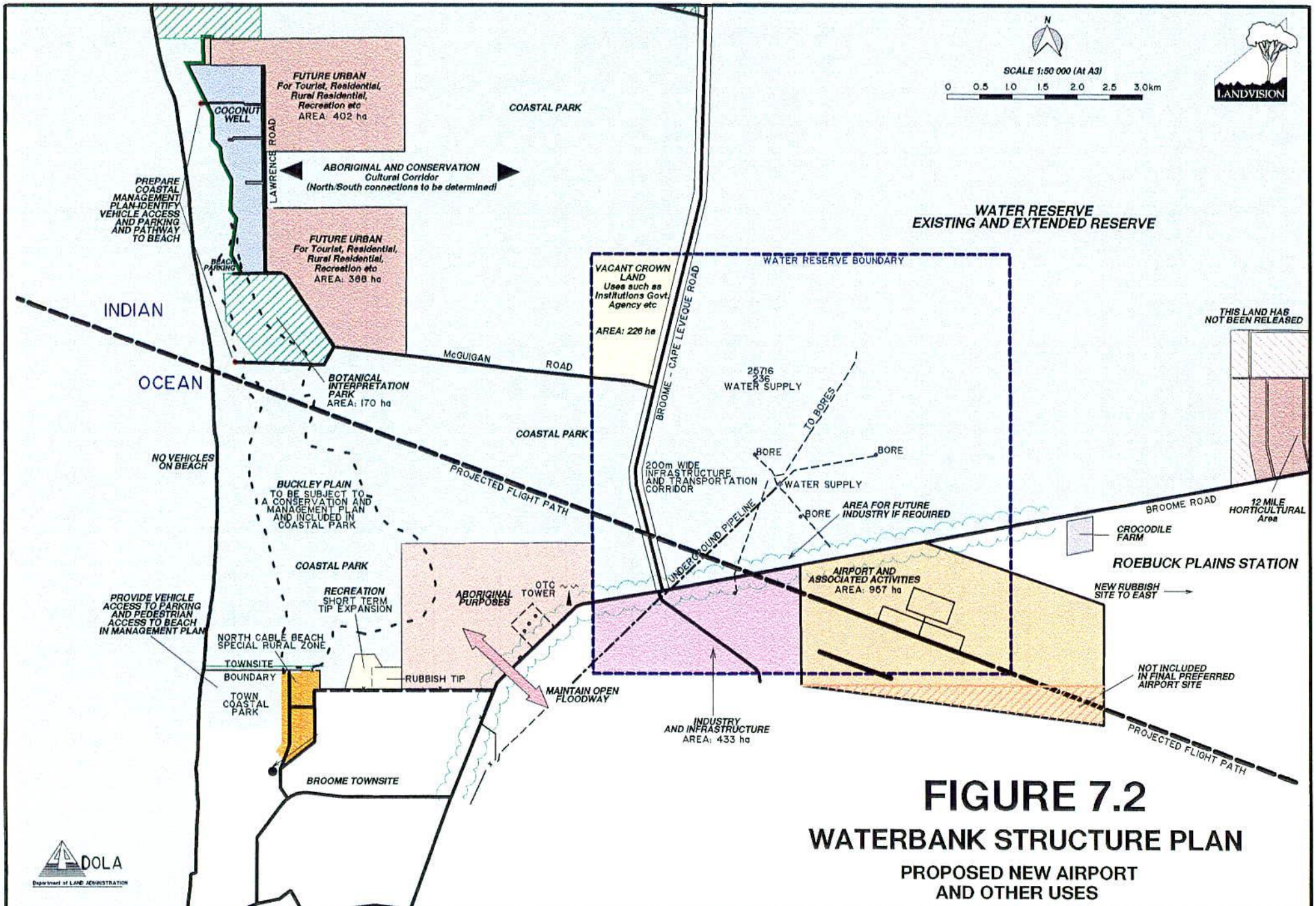


FIGURE 7.2

WATERBANK STRUCTURE PLAN

PROPOSED NEW AIRPORT AND OTHER USES

Source : WaterBank Structure Plan (Government of Western Australia April 1999)

E:\ES995308\DWG\DRAWINGS\FIGURE72.DGN

Future planning around the proposed airport site should also be in accordance with the precedent adopted by the Western Australian Planning Commission (WAPC) for Perth International and Jandakot Airports. In 1988, the State Planning Commission (now WAPC) created a working group to investigate land use planning adjacent to airports with particular reference to Perth International and Jandakot Airports.

The working group's recommendations included:

- the adoption of the ANEF system as a basis for determining the extent of aircraft noise nuisance;
- that land use planning authorities adopt the land use compatibility advice published by Commonwealth Aviation Safety Authority (CASA) and included in Australian Standard AS2021-1985 (now AS2021-1994) as a basis for land use zoning and the control of development; and
- that the FAC's Ultimate Capacity ANEC for Perth International Airport be used as a basis for land use planning within those areas not currently zoned for residential development with no further residential zoning to take place inside the 25 ANEF noise contour.

The WAPC subsequently adopted these recommendations. AS2021-1994 also contains recommendations for land use compatibility. The Building Site Acceptability Table from this Standard is reproduced below (see Table 7.1). New residential and other noise sensitive facilities in areas affected by aircraft noise should be constructed to the standards recommended in AS2021-1994.

Table 7.1: Land use acceptability based on ANEF zones

Building type	ANEF of zone		
	Acceptable	Conditional	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

This standard can be considered to present the limit that is considered acceptable. Where the opportunity arises to achieve a higher standard, as could be the case for the relocated airport at Broome, a more stringent approach would be to establish a larger buffer zone around the airport and to ensure that no noise sensitive land use occurs within it. This will allow the airport to operate as a major international airport without being encumbered by noise issues in the long term future. The proponent will make this information available to the Shire of Broome and liaise with the Shire in respect of future planning for areas adjacent to the proposed airport site.

7.5 Outcomes and EPA Objectives

The findings of detailed flight forecasting and noise modelling for the proposed airport were that there are no sensitive receivers within the project 20 ANEF contour. This means that the proposal would comply with Australian Standard AS 2021-1994 without the need for any special management measures. This means that the proposal would comply with the relevant Australian Standard which has previously been endorsed by the WAPC as standard for the assessment of airport noise nuisance.

Given this, it is considered that the EPA's objective with respect to noise emissions to:

- ensure that noise impacts emanating from the proposal comply with acceptable standards,

can be met by the proposal.

In addition, the assessment has provided the necessary information to allow for future planning to take appropriate account of the noise exposure associated with the proposed site. This information will be provided to the Shire of Broome by the proponent and ongoing liaison will take place to ensure that future land use planning in areas adjacent the site comply with AS 2021-1994.

Given this, it is considered that the EPA's objective with respect to noise in the context of social surroundings to:

- ensure that the welfare and amenity of residents are not adversely affected,

can be met by the proposal.

8.0 Culture and Heritage

8.1 Background and Methodology

There is one registered native title claim (Claim Number WC99/023) that affects the area proposed for the airport relocation. BART carried out an extensive programme of consultation and negotiation with the Rubibi Working Group (the native title claimant) throughout the site selection process.

Liaison and database searches were carried out with the Western Australian Heritage Council and the Australian heritage Commission to identify any sites of European heritage significance in the development area.

8.2 Heritage Sites

A Work Programme Clearance over the southern site was arranged by Rubibi, funded by the airport owners and carried out by Dr. Patrick, Senior Anthropologist for the Kimberley Land Council (KLC). The Clearance Report carried out by the KLC for the site proposed for the airport concluded:

"With the safeguards proposed and the flight paths indicated the present southern option for the relocation of the Broome international airport is clear of Aboriginal heritage concerns."

Database searches provided by the Western Australian Heritage Council and the Australian heritage Commission revealed that there are several sites of significance within the Broome town site, but none in the area proposed for the airport. Roebuck Bay is listed on the Register of the National Estate, and the key implications of the proposal for the Bay are discussed in Sections 4.4 and 4.5.2.

8.3 Potential Impacts and Their Management

As there are no sites of ethnographic or archaeological significance within the area proposed for the development, there will be no impacts on any known sites protected under the *Aboriginal Heritage Act 1972.*

Extensive consultation has been carried out with local Aboriginal people with cultural ties to the subject land as part of the planning and option evaluation for the relocated airport (see Section 1.6, 2.3 and Appendix 7). This resulted in selection of particular options and modification of proposed flight paths with the specific intention of avoiding impacts to areas of significance to Aboriginal people.

The Broome Airport Relocation Implementation Committee (BARIC) and the airport owners have maintained an ongoing consultation process with the native title claimants and Government to work through native title issues in relation to the proposed site. This dialogue will be continued through to the implementation of the project.

No sites of European heritage significance will be affected by the proposal and no special management is therefore required.

8.4 Outcomes and EPA Objectives

The proposed site for the airport has been identified by the KLC as being free of Aboriginal Heritage concerns. Given this, it is considered that no special management is required for this factor and the EPA's objectives of ensuring that:

- the proposal complies with the *Aboriginal Heritage Act 1972*;
- changes in the biological and physical environment resulting from the project do not adversely affect cultural associations with the area; and
- the requirements of the *Western Australian Heritage Act 1972* and the *Australian Heritage Commission Act 1975* are met and the identified values of places listed in the register of the National Estate are protected,

can be met by the proposal.

9.0 Public Health and Safety

9.1 Background

Airports have intrinsic risks associated with their operations. Public risk is typically defined as the risk of fatality or injury to a person or entity not directly related to the airport as an outcome of the airport's operations (EPA, 1992). This may also cover damage to property and the environment. The functions of the airport which may generate such risk include:

- the arrival and departure of aircraft;
- fuel transport and handling;
- health issues associated with liquid and solid waste management; and
- risks associated with fixed infrastructure.

9.2 Public Risk and Hazard Assessment

The Broome Airport is currently situated in the centre of the Broome town site and immediately adjacent to residential areas. In consideration of societal risk according to EPA Bulletin 627 (EPA, 1992), there are two key aspects:

1. the number of people exposed to risk is important; and
2. society is more averse to incidents which result in multiple fatalities or injuries.

The proposal will result in the relocation of the existing airport operation from a centre of urban development to a location 12 km from the town of Broome. This constitutes a clear improvement in the level of public risk associated with the operation of the airport as there will no longer be residences in the immediate vicinity of the airport. This also extends to consideration of environmental and property damage risks, with the proposal providing for separation from Dampier Creek and infrastructure within the town of Broome.

In addition to this improvement to public safety, management will be put in place to ensure that risks associated with the potential introduction or spread of disease from aircraft waste is adequately managed (see Section 6.3). Fuel storage and handling management measures will also serve to reduce risks associated with this aspect of the airport's operations (see Section 6.3). Again, the separation of the development from the town serves to provide additional reduction of these risks.

The proximity of the new airport to the RAMSAR recognised wetlands in the east and south inter-tidal zone of Roebuck Bay means that there may be an increased risk of contact by aircraft with migratory shore birds. A risk assessment was undertaken by Kubu Australia Pty Ltd to analyse the risk and potential losses from this hazard using a combination of known information about the situation, knowledge about the underlying process, and judgment about the information that is not well understood. The risk assessment was done in four steps:

1. Hazard identification,
2. Evaluation of the relationship between exposure to a risk, and adverse effects,
3. Exposure assessment; evaluating the conditions that lead to exposure to a risk,
4. Risk characterisation - describe nature of adverse effects, their likelihood, and the strength of the evidence behind these characterisations.

Hazard Identification

The hazard identification showed that the risk could be considered in two parts: the normal risk of contact by aircraft with birds at Broome, and the particular risk of contact with migratory shore birds during their migration at Broome. This migration occurs over approximately a six week period in April/May each year, and the majority of migratory flights occur over approximately two hours prior dusk each day during this period.

Relationship between risk and adverse effect

The evaluation of the relationship between exposure to the risk of aircraft/bird contact, and adverse effects, was done by using available air safety data.

The Birdstrike Information System (IBIS) of the International Civil Aviation Organization (ICAO) enabled an analysis of birdstrike reports that are received from different countries. The analysis of the birdstrikes contained in the IBIS system between 1989-1992 (Transport Canada, 1994), reveals the following:

- The total number of birdstrikes that occurred worldwide between 1989 and 1992 was 16,488. With an estimated 62 million Regular Public Transport (RPT) flights worldwide during that period, the risk of birdstrike can be estimated as 0.00026 birdstrikes per movement for this data set. Note that not all parameters were reported for every birdstrike, so the totals in the detailed analysis of this study may not equal 16 488

- Most strikes occurred around airports. It was noted that this was very similar to published US data (NWRC-Ohio Field Station, 2000);

PHASE OF FLIGHT	STRIKES
Parked	45
Taxi	73
Take-off Run	3213
Climb	2179
En route	218
Descent	381
Approach	5018
Landing Roll	2701

- Most birdstrikes caused no damage to the aircraft.

AIRCRAFT DAMAGE	NUMBER OF STRIKES
None	15,315
Minor	690
Substantial	483

- There was generally no adverse effect on flight, and where there was an adverse effect, it was primarily aborted take-offs and precautionary landings.

EFFECT ON FLIGHT	NUMBER OF STRIKES
None	12 078
Aborted take-off	255
Precautionary landing	442
Engine(s) shutdown	73
Forced landing	22
Fire	3
Penetration of windshield	7
Penetration of airframe	1
Vision obscured	24

Longer term but less detailed data are also available from ICAO. Birdstrike reporting became automated in 1980 with the introduction of the ICAO birdstrike information system (IBIS). Since that time, ICAO has collected data on approximately 78,000 birdstrikes from more than 190 States and territories throughout the world (Rao and Pinos, 1998). During that period, there were approximately 198.8 million RPT movements worldwide. This enables the long term reported birdstrike rate per RPT aircraft movement to be calculated as 0.00039, which is similar to the earlier estimate from more limited data. Given that not all birdstrikes around the world are likely to be reported, the true birdstrike rate may be slightly higher than this.

Longer term data on the adverse consequences of birdstrikes is also available (Davidson, 1995). Worldwide to January 1992, there were 3.38 billion civil aircraft movements (both RPT and general aviation (ICAO Journal; Horonjeff and McKelvey, 19)), and 22 fatal civil aircraft accidents (Davidson, 1995). This gives a long term worldwide fatal accident rate per civil aircraft movement of 0.0000000065. Here, the term civil aircraft means both RPT and general aviation aircraft. In the same period, there were 5 total hull loss accidents to commercial jet airliners of which one was fatal (Birdstrike Committee USA Internet site:http://birdstrike.org); this was taken as the ratio of hull loss to fatal aircraft accidents.

The data from Australia on the adverse consequences of birdstrikes showed that there have never been any RPT accidents due to birdstrikes in over 50 years. At these very low levels of likelihood, there is simply too little data in Australian operations to give meaningful statistics. The long term worldwide fatal accident rate was therefore taken as the best estimate of the rate for Australia and Broome. Some indication of the number of birdstrikes in Australia is given by the reported 492 birdstrikes to civil aircraft in Australia during 1999 (BASI, 2000), with no reported accidents (or fatal accidents) as a result of these birdstrikes. Again, worldwide rates have been taken as the best estimator of adverse effects for Australia and Broome.

The worldwide rates were used to compile the likelihood of the various adverse risks. These are shown in the following table.

ADVERSE RISK	LIKELIHOOD
Birdstrike rate per RPT aircraft movement	0.00039
Precautionary landing or aborted takeoff	0.000011
Engine(s) shutdown	0.0000012
Forced landing	0.00000035
Hull loss	0.000000033
Fatal accident	0.0000000065

The table shows that ICAO airport and aircraft operation standards, and aircraft design standards, manage the adverse effects of the bird/aircraft contact risk well.

Exposure Assessment

The exposure assessment - evaluating the conditions that lead to exposure to a risk was done by calculating the likelihood for two risks at Broome: the so-called "normal risk of contact by aircraft with birds" at Broome, and the particular risk of contact with migratory shore birds during their migration at Broome.

There are several methods that can be used to estimate risk:

- With historical data,
- By modelling,

- By analogy with similar situations,
- By comparison with similar activities, or
- If no data is available, by breaking down the system into known sub-systems using techniques such as event trees or fault trees,.

"Normal risk of contact by aircraft with birds"
The so-called "normal risk of contact by aircraft with birds" was calculated using the methods of historical data and modelling. Risk here was defined as the combination of a specific hazard and the likelihood of that hazard. The specific hazards in this context are birdstrike events that result in:

1. Both fatalities and aircraft hull loss,
2. Aircraft hull loss only, or
3. An aborted takeoff or precautionary landing, or other important adverse consequence.

Because the likelihood rates tabled earlier are very low, small variances can influence the result disproportionately. Where adequate data was available, more than one method or data set was used to provide a check on the result.

Firstly, the world-wide adverse risk rate data tabled above were used. For the 13,492 total civil aircraft movements at Broome airport in 1999, the number of fatal civil aircraft accidents per year was calculated as:

13,492 x 0.0000000065 = 0.000088, which is approximately one every 11,400 years.

Similar calculations were used to estimate the likelihood of adverse consequences of bird/aircraft contact for civil aircraft at Broome airport.

ADVERSE RISK	LIKELIHOOD	RATE PER MOVEMENT	YEARS PER EVENT
Birdstrike rate per RPT aircraft movement	0.00039	5.26	0.19
Precautionary landing or aborted takeoff	0.000011	0.15	6.7
Engine(s) shutdown	0.0000012	0.016	62
Forced landing	0.00000035	0.0047	212
Hull loss	0.000000033	0.00045	2246
Fatal accident	6.5E-09	0.000088	11403

The effect of growth of aircraft movements will be to increase this risk over time. Some idea of the magnitude of change was found by totaling the forecast civil aircraft (RPT and general aviation) over the forecast period (to 2025), which was 614,567. This was then multiplied by the fatal accident rate per movement and averaged over the period to give an average fatal accident rate of 0.000148 per year, which is one in approximately 6,700 years over the forecast period.

As a check, the procedure of the Birdstrike Committee USA (Birdstrike Committee USA Internet site:http://birdstrike.org) was used to estimate the probability of a fatal accident involving a birdstrike to a large commercial jet transport (RPT) aircraft occurring in the next ten years at Broome Airport. This used the following information:

1. Fatal and non-fatal worldwide large commercial passenger jet aircraft hull losses since 1959 (five total, one fatal),
2. Total jet transport flights since 1959 (about 300 million),
3. Estimated Broome commercial transport (RPT) flights in the ten years

2000-2009 (64,350),
4. Average forecast Broome load factor of 60%,
5. Average aircraft passenger capacity (100), and
6. Probability that a passenger dies in a fatal birdstrike accident (0.5).

Assuming a binomial distribution of events, this was found to imply that over the next decade,
P(Zero Fatal Hull Losses) = 0.9998
P(One Fatal Hull Loss) = 0.0002
P(Two Fatal Hull Losses) = 2.07E-08
P(Three Fatal Hull Losses) = 1.18E-12
Estimated Fatal Hull Losses = sum of the probabilities = 1(0.0002) + 2(2.07E-08) + 3*(1.18E-12) = **0.0002145**

This last figure means that in the next 10 years there is about a 0.0002145 chance of a fatal birdstrike accident involving an RPT transport at Broome Airport. This is equivalent to a fatal RPT birdstrike accident approximately every 4,700 years, which compares quite closely with the other methods of estimate.

In the above analysis of "normal risk of contact by aircraft with birds", there was no account taken of any difference between the existing Broome Airport and the relocated Broome airport. In the calculation, the risk depends only on the number of aircraft movements, which have been taken to be the same at both airports.

The relocated Broome airport will, in itself, make no difference in the numbers of flights or passengers travelling to Broome. The generator of travel is the town of Broome, not the airport. Changes in numbers have been forecast during the period to 2025, such as growth in passengers or aircraft movements, and the introduction of international flights, and changes in aircraft types. Apart from the effect of worsening constraints of the existing airport, these changes will occur independently of whether the existing airport is maintained or the airport is relocated. For Broome Airport, the "normal risk of contact by aircraft with birds" is assessed as very low, and the adverse effects of that "normal risk of contact by aircraft with birds" are assessed as extremely low.

Particular risk of contact by aircraft with migratory shore birds during their migration
The "particular risk of contact by aircraft with migratory shore birds" during their migration for the relocated Broome Airport was then assessed. The possible methodologies that could be used for evaluating risk were those noted above. The assessment of risk was more difficult though because it depends on the location of the airport relative to the flight path of the migratory birds. This will change from the existing airport to the relocated airport.

Modelling the risk of contact at the relocated site was considered as a means of assessing this, but was rejected. In such a model, the risk of contact could be expressed in terms of the probability of aircraft path and migratory bird path intersecting. There is uncertainty associated with both of these. The uncertainty could be defined using probability methods (mathematically by defining each by the individual probability density functions). The risk of contact could then be expressed as a joint probability density function of the individual probabilities.

Unfortunately there is insufficient data available to model either of these individual probability density functions satisfactorily. While the path of aircraft can and is shown by a single line representing the most likely path, there is a variance associated with that single line. The path of aircraft is known to fluctuate due to changes in weather (wind, temperature, rain, storm, cloud, air density, etc), and other variations such as aircraft performance, aircraft load, pilot technique,

proximity to other aircraft, operational instructions, etc.

There is less knowledge about the path of migratory birds, although intuitively it can be expected to vary considerably due a variety of factors. To collect sufficient data to give statistical validity to the modelling of the aircraft or bird paths would require many years of data to be collected.

However, the close proximity of the existing Broome airport to the relocated Broome airport enabled the risk to be assessed by using "analogy in a similar situation". The specific issues to be considered using analogy are:

1) Is the risk of contact by aircraft with migratory shorebirds migrating at the existing Broome airport greater than the "normal risk of contact by aircraft with birds" at airports?
2) Is the risk at the relocated airport materially different to that at the existing airport?

There is extensive data from the existing airport at Broome. The original date of commencement of civil air operations at the existing airport was not available, but operations have continued without break from the end of Second World War to the present. This gives in excess of 50 years of operational data on aircraft/bird interaction and interaction of aircraft with migratory shore birds.

During this period, there have been a number of birdstrikes at the existing airport with no hull losses and no fatal accidents. The existing airport has co-existed with the migratory shore birds, and the RAMSAR recognised wetlands in the eastern and southern inter-tidal zone of Roebuck Bay throughout this period.

Although the long term data on accidents and fatalities due to birdstrikes is available, the recorded data on the number of birdstrikes at Broome is very limited, because there was no data for the period from 1992 to 1998 while the Australian birdstrike reporting system was not in use. In 1999, there were 6 recorded birdstrikes (BASI, 2000). To get additional insight, the Airport Manager at the existing Broome Airport (R McLeod, JP) was interviewed. He reported that the incidence of birdstrikes during his period of management from 1991 to 2000, showed little annual variation. In particular, he considered 1999 to be a normal year for birdstrikes. It was assumed therefore that 6 birdstrikes per year was a reasonable indication of the long term average at the existing Broome airport.

The long term worldwide birdstrike rate was shown earlier as 0.00039 per RPT movement. A linkage between birdstrike frequency for RPT aircraft and for civil aircraft was the calculated fatal birdstrike accident rates above, which compared quite closely. Therefore the long term birdstrike rate was taken as approximately 0.00039 per movement for all civil aircraft movements.

This long term birdstrike rate for civil aircraft was applied to the frequency of movements at the existing Broome airport, which was 13,492 civil aircraft movements in 1999. This forecast 5.3 birdstrikes, which correlates well with the actual reported 6 birdstrikes during that period.

The incidence of birdstrikes at the existing Broome airport is in line with long term worldwide birdstrike norms. The "particular risk of contact by aircraft with migratory shorebirds during their migration" at the existing Broome airport is therefore taken as not greater than the "normal risk of contact by aircraft with birds" at airports.

Risk at relocated airport relative to existing airport
If the risk at the relocated airport is materially different to that at the existing airport was then assessed by considering their position relative to the path of the

migratory birds. This included consideration of changing aircraft flight paths.

The existing airport and the relocated airport are approximately 8 kilometres apart. Both airports are approximately the same distance from the RAMSAR recognised wetlands in the eastern and southern inter-tidal zone of Roebuck Bay (Figure 4.1 & 4.2). The existing airport is to the north west of the wetlands, and the relocated airport is to the north of the wetlands. The data from the studies by Lane and Jessop (1985) and Tulp et al (1994) show both to be under the flight path of the migratory birds.

In terms of changing aircraft paths, the path of aircraft to and from the airports is shown on Figure 4.3, and is represented there by a single line representing the most likely path. However, as discussed earlier, there is variability around that single line. Over time, the variability of aircraft around the mean flight path is such that, given the partially overlapping flight paths of the existing airport and the relocated airport (which are in close proximity with each other), there will be a good deal of commonality or overlap in flight paths of the two airports. Although certain generalisations can be drawn, such as:

- the flight paths of the relocated airport are more easterly than the flight paths of the existing airport, or
- for the relocated airport, the path of aircraft can be expected to be higher over the wetlands than for the existing airport;

in terms of modelling the path of aircraft and representing it by a probability density function, the overlap between flight paths is such that there will be only small differences in the model of the existing airport and the relocated airport. Since both airports are in the flight path of the migratory birds (discussed above), this will make comparison between the two rather difficult at the probabilistic model level.

One concern was raised that notwithstanding the similarity between the two airports, there might be a particular concentration of birds such that relocated airport could be directly under a concentrated stream of migratory birds. This is not as reported by Tulp et al (1994), although there is insufficient quantitative data in the study on the probability distribution of migratory shorebirds within the general migratory flight path. Furthermore at the very low likelihood of risk that applies here, it is doubtful whether even such a concentration would make a material difference to the risk.

However to obtain more understanding, a survey was conducted of general aviation pilots who had flown in the vicinity of the site of the relocated airport to gather their experiences with birds in that area. There was no evidence to suggest that birdstrike risk will change substantially at the relocated airport. The opportunity will also be taken during the year 2000 migration to further study the probability density function of birds within the overall migratory pattern of Tulp et al., and that will be used to update the relocated airport risk assessment at a later stage.

However on the substantial evidence available from the many years of operations at the existing Broome airport, and considering that both the existing and new airports lie at similar distances from the wetlands and both under the flightpath of the migratory shore birds, it is therefore considered that the "particular risk of contact by aircraft with migratory shore birds" is similar for existing airport and the relocated airport.

The risk of contact by aircraft with migratory shore birds at the relocated airport is therefore assessed as very low, and the adverse effects of that contact are again assessed as extremely low.

Risk management
To manage that risk at the existing airport, bird management is carried out on a day to day basis by means of regular checks, drainage and rubbish control, bird harassment, and participation in the Airservices Australia bird reporting programme. At the relocated airport, the same birdstrike management practices will be implemented.

Risk characterisation
The risk is aircraft/bird contact, and especially aircraft/migratory shore bird contact during migration by virtue of the proximity of the new airport to the RAMSAR recognised wetlands in the east and south inter-tidal zone of Roebuck Bay.

The likelihood of adverse consequences of bird/aircraft contact for civil aircraft at Broome airport have been calculated as follows:

ADVERSE RISK	LIKELIHOOD	RATE PER MOVEMENT	YEARS PER EVENT
Birdstrike rate per civil aircraft movement	0.00039	5.26	0.19
Precautionary landing or aborted takeoff	0.000011	0.15	6.7
Engine(s) shutdown	0.0000012	0.016	62
Forced landing	0.00000035	0.0047	212
Hull loss	0.000000033	0.00045	2246
Fatal accident	6.5E-09	0.000088	11403

The strength of evidence is generally good. Because of the very low levels of likelihood, substantial data would have to be used to get meaningful results. These were available, with worldwide birdstrike and accident data over many years, Broome aircraft/birdstrike accident data over 50 years, Broome aircraft operation/migratory bird interaction data over 50 years, and Broome birdstrike data over 9 years. The flightpath of the migratory shore birds is known, although there is some uncertainty about possible bird concentrations within this flightpath. Such concentrations are probably immaterial to the risk, but additional studies are in progress to collect more data.

The risk of contact by aircraft with birds and with migratory shore birds during migration at the relocated Broome airport is assessed as very low, and the adverse effects of that contact are assessed as extremely low.

9.3 Outcomes and EPA Objectives

The proposal will result in the Broome airport, and the public safety risks associated with its operation, being removed from the town site. Other management measures will be in place to ensure that fuel and waste associated risks are kept to an absolute minimum.

Given this, it is considered that no additional risk management is required and the EPA's objectives of ensuring that:

- the proposal is managed so that the level of public risk meets the EPA's criteria for individual fatality risk off site and meets the DME's requirements in respect of public safety; and
- Ensure that the public risk associated with construction and operation of the airport are as low as possible and in compliance with the criteria detailed in EPA Bulletins 611 and 627

can be met by the proposal.

PART III

Proponent Commitments and Draft Environmental Management Plan

10.0 Environmental Management Commitments

Broome International Airport holdings, as proponent for the relocation of Broome International Airport, makes the commitments outlined in Table 10.1 below.

Table 10.1: Proponent's commitments

Proponents Commitment	Objective	Action	Timing	Whose requirements / advice
1. Prepare and implement an Environmental Management Plan	To ensure that environmental impacts are prevented or minimised in the design, construction and operation of the relocated Broome Airport.	Prepare and implement an Environmental Management Plan to address construction management issues (dust management, weed control, vegetation clearing and management) and operational management issues (potential contaminant handling and storage, waste management).	Develop prior to construction, implement during construction and operations.	CALM, DEP, Shire of Broome
2. Prepare and implement a Drainage Management Plan	To ensure that changes to surface hydrology and groundwater quality of the surrounding area are prevented or adequately managed.	Prepare and implement a Drainage Management Plan including identifying suitable hydrological parameters and design criteria, design and construction of drainage and pollutant controls, inspection and maintenance procedures.	Develop prior to construction, implement during construction and operations.	Water and Rivers Commission, Shire of Broome
3. Carry out a second seasonal flora confirmation survey	To ensure that any significant flora that may have been undetected due to seasonality are identified and managed.	Carry out second site flora survey and develop any specific management measures as appropriate.	Prior to construction. Proposed for May, following the summer rains.	CALM
4. Implement control of Declared Noxious weeds	To ensure that noxious weed infestations on the site are eradicated and not spread.	Eradicate known populations Implement control measures.	Prior to construction During construction.	CALM, Agricultural Protection Board
5. Prepare and implement a Landscape Management Plan	To maximise the retention of local landscape values and enhance the visual amenity of the finished airport.	Retain local landscape character and remnant vegetation. Undertake appropriate earthworks and planting treatments.	Develop during final design, implement during construction.	Shire of Broome
6. Carry out a migratory bird watch and continue liaison with Broome Bird Observatory	To improve the understanding of migratory bird routes in the Broome area and maintain aviation management to minimise bird strike risk.	Carry out migratory bird watch and continue liaison with Broome Bird Observatory to take account of any relevant information in management procedures.	Prior to construction, Operations	DEP, CALM
7. Continue consultation programme	To ensure that key stakeholders are kept appraised of developments.	Continue liaison with key stakeholders, public meetings / advertisements as appropriate.	Prior to and during construction.	Shire of Broome

11.0 Draft Environmental Management Plan

A draft outline of the Environmental Management Plan (EMP) is provided for the purposes of this PER. Note that this draft EMP provides indication of the management measures that will be developed and implemented by the proponent and is not final. Final management measures will require consideration and input to detailed engineering design and land use planning and cannot be presented at this stage of the project.

Draft EMP Table of Contents

12.0 References

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Appendix 1

EPA Guidelines for the Public Environmental Review

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Environmental Protection Authority
Draft Guidelines

RELOCATION OF BROOME INTERNATIONAL AIRPORT

Proponent: Broome International Airport Holdings Pty Ltd

(Assessment Number 1294)

Part A	Specific Guidelines for the preparation of the Public Environmental Review
Part B	Generic Guidelines for the preparation of an environmental review document

Attachment 1	Example of the invitation to make a submission
Attachment 2	Advertising the environmental review
Attachment 3	Project location map - from proponent's referral document

These guidelines are provided for the preparation of the proponent's environmental review document. The specific environmental factors to be addressed are identified in Part A. The generic guidelines for the format of an environmental review document are provided in Part B.

The environmental review document must address all elements of Part 'A' and Part 'B' of these guidelines prior to approval being given to commence the public review.

Part A: Specific Guidelines for the preparation of the Public Environmental Review

1. The proposal

The Broome International Airport Holdings Pty Ltd (the proponent) intends to construct and operate a new international airport at some 12 km east of Broome townsite. The proposed airport is indicated on the attached plan (Attachment 3).

The site for the airport, which has been identified in the draft Waterbank Structure Plan, is within the southern portion of Water Reserve No. 25716, south of the Great Northern Highway.

The site allows for:

- one main runway of initially 2700 m in length x 45 m in width, allowing for unrestricted access for Boeing 767-300 operations;
- capacity to extend the runway length to up to 3500 m to allow for Boeing 747 aircraft;
- parallel taxiway;
- turning nodes;
- apron parking for up to 10 aircraft;
- GA parking;
- maintenance and storage hangars;
- terminals - domestic and international;
- fuel storage;
- future short parallel runway for light aircraft;
- landside and airside commercial activities.

Construction is estimated to cost about $40 million and would be phased over five to seven years, subject to land sales on the existing airport site.

The proponent is requested to supply the project officer with an electronic copy of the document for use on Macintosh, Microsoft Word Version 6, and any scanned figures. Where possible, figures should be reproducible in a black and white format.

2. Environmental factors relevant to this proposal

At this preliminary stage, the Environmental Protection Authority (EPA) believes the relevant environmental factors, objectives and work required is as detailed in the table below:

CONTENT		SCOPE OF WORK	
Factor	**Site Specific Factor**	**EPA Objective**	**Work required for the environmental review**
Terrestrial Flora	Vegetation	Maintain the species abundance, diversity, geographic distribution and productivity of the vegetation.	Baseline studies by appropriately trained and experienced persons under appropriate seasonal conditions to identify existing vegetation within the proposal area. Map and describe the vegetation and relate these mapped units to soil/ landform types. Provide an assessment of the local and regional significance of the floristic communities present in the proposal area. Assessment of potential impacts (direct and indirect) on vegetation (local and regional, terrestrial and aquatic) as a result of the construction and operation of the airport and associated activities. Identify risks of exotic species and diseases being introduced to the environment. Propose measures to mitigate impacts.

CONTENT		SCOPE OF WORK	
Factor	**Site Specific Factor**	**EPA Objective**	**Work required for the environmental review**
	Declared Rare and Priority and other significant Flora	Protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act and the Commonwealth Endangered Species Act.	Targeted search by appropriately trained and experienced persons under appropriate seasonal conditions to identify Declared Rare and Priority flora likely to occur on the subject land. Analysis of likelihood of occurrence of taxa not flowering at time of survey. Identify other species of significance which may be impacted by the proposals and discuss the reason for their conservation significance. These species may include undescribed species, new records for the region, species or taxa that are endemic to the region, or species confined to specific sites of limited occurrence in the region. Retain voucher specimens from all significant species and lodge them with the WA Herbarium. Propose measures to manage and/or mitigate impacts.
Terrestrial Fauna	Terrestrial Fauna	Maintain the species abundance, diversity and geographical distribution of fauna.	Baseline studies to identify existing fauna in the project area. Assessment of potential impacts (direct and indirect) on fauna (local and regional, terrestrial and aquatic) as a result of the construction and operation of the airport and associated activities. Identify risks of exotic species and diseases being introduced to the environment. Propose measures to manage impacts.
	Specially Protected (Threatened) and Priority Fauna	Protect Specially Protected (Threatened) and Priority Fauna and their habitats, consistent with the provisions of the Wildlife Conservation Act and the Commonwealth Endangered Species Act.	Baseline study/ or targeted search by appropriately trained persons for Specially Protected (threatened) and Priority Fauna which may occur in the project area. Analysis of the values of affected land as habitat for endangered fauna. Propose measures to manage impacts.
	Migratory birds	Avoid impacts on migratory birds and their habitats. Meet Australia's international agreements on migratory birds.	Assessment of potential impacts of the proposal on migratory birds, their habitats and flight paths. Propose measures to manage impacts.
Land	Landform	Establish stable, sustainable landform consistent with surroundings.	Assessment of potential impacts of the proposal on existing landforms. Detail of erosion management measures.

CONTENT		SCOPE OF WORK	
Factor	**Site Specific Factor**	**EPA Objective**	**Work required for the environmental review**
POLLUTION MANAGEMENT			
Water	Groundwater quality	Maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the draft Guidelines for Fresh and marine Waters (EPA, 1993).	Detail of water requirements for the construction and operation of the airport and associated activities. Detail of drainage and fate of water used in of the construction and operation of the airport and associated activities. Assessment of impact from any change in groundwater quality on surrounding environment. Detail of impact from hydrocarbons and other potential contaminants use and storage on surrounding environment. Assessment of potential impact on groundwater reserve and Roebuck Bay. Propose measures to manage impacts.
	Surface water quality	Maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the draft Guidelines for Fresh and Marine Waters (EPA, 1993).	Detail of water requirements for the construction and operation of the airport and associated activities Detail of drainage and fate of water used in the construction and operation of the airport and associated activities. Detail of disposal of plant site waste, particularly sewage. Detail of how surface water discharge will be managed to minimise risk of erosion. Assessment of potential impact on Roebuck Bay. Assessment of impact from any change in surface water quality on surrounding environment. Propose measures to manage impacts.

CONTENT		SCOPE OF WORK	
Factor	**Site Specific Factor**	**EPA Objective**	**Work required for the environmental review**
Non-chemical Emissions	Noise	Ensure that noise impacts emanating from the proposal comply with acceptable standards.	Define number and type of aircraft, flight times and paths as far as practicable for normal and likely maximum operational capacity over the long term (25 years). Undertake studies to identify ambient noise levels at potentially affected premises. Assessment of potential increases in noise resulting from the construction and operation of the airport and associated activities. Assessment of potential impacts of any increased noise on the amenity of surrounding land users. Propose measures to manage impacts.
SOCIAL SURROUNDINGS			
Social surrounds	Noise	Ensure that the welfare and amenity of residents are not adversely affected.	Describe how planning authorities will achieve appropriate separation between noise affected areas and noise sensitive premises.
Aesthetic	Visual amenity	Visual amenity of the area adjacent to the project should not be unduly affected by the proposal.	Assessment of potential impacts on visual amenity of the project area and surrounds from the proposal, particularly in relation to Broome road. Propose measures to manage impacts.
Culture and Heritage	Aboriginal culture and heritage	(i) Ensure that the proposal complies with the requirements of the *Aboriginal Heritage Act 1972*; and (ii) Ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area.	Identify any Aboriginal cultural and heritage sites/issues of significance through archaeological and ethnographical surveys of the project area and through consultation with local Aboriginal groups, Native Title claimants and the Aboriginal Affairs Department. Identify potential impacts on any identified sites. Propose measures to manage impacts.

These factors should be addressed within the environmental review document for the public to consider and make comment to the EPA. The EPA expects to address these factors in its report to the Minister for the Environment.

The EPA expects the proponent to take due care in ensuring any other relevant environmental factors which may be of interest to the public are addressed.

3. Availability of the environmental review

3.1 Copies for distribution free of charge

Supplied to DEP:

- Library/Information Centre.....9
- EPA members.....6
- Officers of the DEP (Perth & Karratha) 6

Distributed by the proponent to:

Government departments	• Department of Transport.....3 • Water and Rivers Commission .....2 • Department of Conservation and Land Management... 2 • Department of Land Administration.....2 • Aboriginal Affairs Department.....2 • Department of Resources Development.....2 • WA Tourism Commission .....2 • Environment Australia 1
Local government authorities	• Shire of Broome.....2 • Broome Shire Councillors.....5?
Libraries	• J S Battye Library .....3 • The Environment Centre.....2 • Broome Library.....2
Other	• Conservation Council of WA .....1 • Kimberley Land Council .....1 • Broome Bird Observatory.....1

3.2 Available for public viewing

- Department of Environmental Protection Library, Perth;
- Department of Environmental Protection Library Karratha Office;
- Broome Library;
- J S Battye Library; and
- The Environment Centre.

Attachment 1

The first page of the proponent's environmental review document must be the following invitation to make a submission, with the parts in square brackets amended to apply to each specific proposal. Its purpose is to explain what submissions are used for and to detail why and how to make a submission.

Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

[the proponent] proposes [the rezoning of land and the development of a Marina Complex in the City of Bunbury]. In accordance with the Environmental Protection Act, a [PER] has been prepared which describes this proposal and its likely effects on the environment. The [PER] is available for a public review period of [8] weeks from [**date**] closing on [**date**].

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the [PER] or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the [PER]:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the [PER];
- if you discuss different sections of the [PER], keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- address;
- date; and
- whether you want your submission to be confidential.

The closing date for submissions is: [**date**]

Submissions should be addressed to:

The Environmental Protection Authority
Westralia Square
141 St George's Terrace
PERTH WA 6000

Attention: **[Project Officer name]**

Attachment 2

Advertising the environmental review

The proponent is responsible for advertising the release and arranging the availability of the environmental review document in accordance with the following guidelines:

Format and content

The format and content of the advertisement should be approved by the DEP before appearing in the media. For joint State-Commonwealth assessments, the Commonwealth also has to approve the advertisement. The advertisement should be consistent with the attached example.

Note that the DEP officer's name should appear in the advertisement.

Size

The size of the advertisement should be two newspaper columns (about 10 cm) wide by about 14 cm long. Dimensions less than these would be difficult to read.

Location

The approved advertisement should, for CER's, appear in the news section of the main local newspaper and, for PER's and ERMP's, appear in the news section of the main daily paper's ("The West Australian") Saturday edition, and in the news section of the main local paper at the commencement of the public review period and again two weeks prior to the closure of the public review period.

Timing

Within the guidelines already given, it is the proponent's prerogative to set the time of release, although the DEP should be informed. The advertisement should not go out before the report is actually available, or the review period may need to be extended.

Example of the newspaper advertisement

Proponent Name

Consultative/Public/ Environmental Review/and Management Programme

TITLE OF PROPOSAL

(Public Review Period: [**date**] to [**date**])

Proponent is planning to brief description of proposal.

A Consultative Environmental Review (CER)/Public Environmental Review (PER)/Environmental Review and Management Programme (ERMP) has been prepared by the company to examine the environmental effects associated with the proposed development, in accordance with Western Australian Government procedures. The CER/PER/ERMP describes the proposal, examines the likely environmental effects and the proposed environmental management procedures.

Proponent has prepared a project summary which is available free of charge from the company's office address.

Copies of the CER/PER/ERMP may be purchased for $5/$10 from:

Company Name
Street
Suburb/Town WA Postcode
Telephone: (08) 9xxx xxxx

Copies of the complete CER/PER/ERMP will be available for examination at:

- Department of Environmental Protection
  Library Information Centre
  8th Floor, Westralia Square
  141 St Georges Terrace
  PERTH WA 6000
- Department of Environmental Protection
  Regional Office - if appropriate
- Relevant local libraries

Submissions on this proposal are invited by [**closing date**]. Please address your submission to:

Chairman
Environmental Protection Authority
8th Floor, Westralia Square
141 St Georges Terrace
PERTH WA 6000
Attention: [**Project Officer name**]

If you have any questions on how to make a submission, please ring the project officer, [**Project Officer name**], on (08) 9222 7xxx.

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BROOME AIRPORT

Relocation

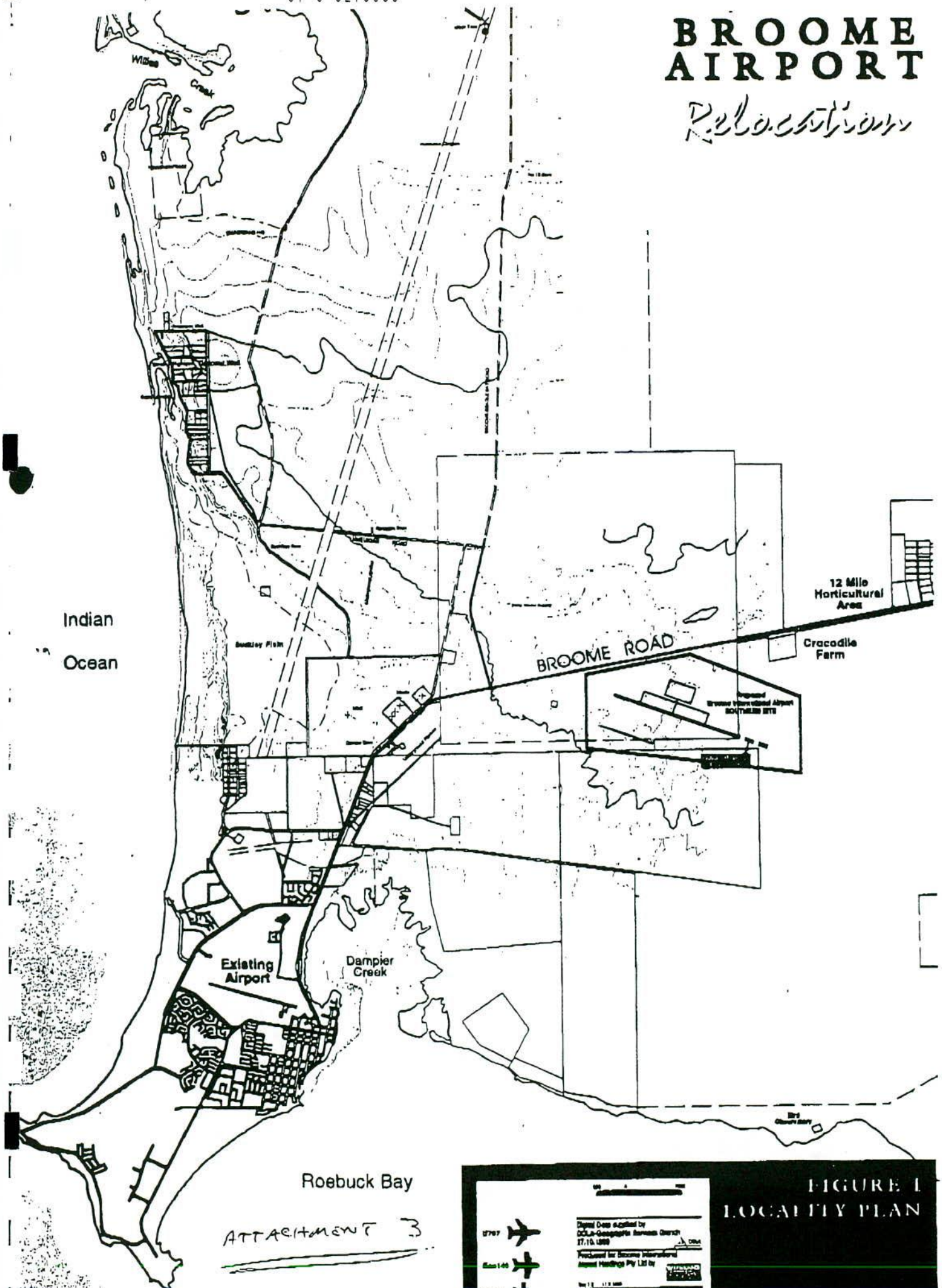

FIGURE 1
LOCALITY PLAN

ATTACHMENT 3

DRAFT

Report on Issues relating to

Public Consultation

and Consideration of Environmental Issues

in regard to the relocation of the

Broome International Airport

Mervyn W Prime
December 1999

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Appendices

Background

When regular air services, operated by West Australian Airways, commenced into Broome in 1922, the sands of Cable Beach were used as the town's first airport. Several years later the airport was located on Broome's racecourse, which at that time was located on land at the western end of what is now the town airport. West Australian Airways lost the airmail contract in 1934, and the north-west route was taken over by the MacRobertson Miller Aviation Company (now part of Ansett Australia).

In the 1930's the racecourse was relocated to Gantheaume Point and the airport expanded in an easterly direction towards the Broome townsite.

Further major expansion of the airport was undertaken in 1941, and the airport saw a considerable increase in air traffic, as Broome was a major staging point with refugees transiting through Broome from the then Dutch East Indies, en-route to safe havens in Australia. The Broome Airport was attacked by Japanese Naval Air Service aircraft on 3rd March and 20th March 1942.

There have been three major aircraft mishaps at Broome post-war, none of which resulted in any fatalities, but in two of the cases the aircraft were written off. In view of the close proximity to the town, and as the extended centre line of the main runway overflies the commercial heart of the town, these aircraft mishaps could have resulted in more serious consequences.

Lord Alistair McAlpine announced in 1989 that he had been negotiating with the Shire to construct a new international airport on land 16 km north-east of the Broome townsite, but this proposal was not proceeded with.

In 1990, in line with it's Airport Local Ownership Plan (ALOP), the Commonwealth Government advertised for public tenders for the sale of the Broome Airport. In the tender documents, the Commonwealth made the following comment:

> *Relocation of the Airport*
> *The existing airport site is earmarked by the Broome Shire for future urban and commercial redevelopment. The Shire is keen to have the airport relocated to another site so as to enable the unimpeded implementation of the Broome Townsite Structure Plan. It is envisaged that the development of a new airport capable of serving a wider variety of aircraft would enhance the tourism potential of Broome and the Kimberley region.*
>
> *The relocation of the airport is not a condition of sale. However, tenderers are encouraged to consider the feasibility of relocating the airport and state their intentions in the Tender Form.*

On 27 March 1991, the Commonwealth Government announced that the Broome Airport had been sold to Airport Engineering Services Pty Ltd (AES) for the sum of $2.85 million. Four tenders had been received for the purchase of the airport.

On the 14th March 1991, the Broome Shire Council and AES entered into a Heads of Agreement, agreeing to the relocation of the Broome Airport to a site outside the town. (This Heads of Agreement was revisited, to increase the size of the design aircraft from a Boeing 737 to a Boeing 767, and a new document registered by the two parties on 8 August 1995).

In March 1992, Broome Airport was granted international status, and in August the same year the runway was extended by 500 metres (to 2026 metres) to enable wide-bodied international aircraft to operate into Broome. Over the next few years a number of international charter flights operated into the town, with a regular international service being operated by National Jet Services, as from 25th January 1996. The flights, linking Broome, Bali, Jakarta, Christmas Island and Singapore were suspended on 17th February 1997, following problems with operations on behalf of the Christmas Island Casino.

In April 1996, the State Government acquired the lease of Waterbank Station, which extends some 60 km northwards along the coast from the Broome townsite. The acquisition was made as the station site provided potential for the expansion of Broome, plus provided additional land for new tourism, resort and investment opportunities together with the scope for long term strategic town planning.

In addition, it was seen that Waterbank Station could provide potential to accommodate a number of diverse uses, including the relocation of the Broome Airport. The draft Waterbank Structure Plan, launched by the Hon Premier, in Broome on 26th October 1997, incorporated ten potential airport sites, with two of these being recommended for further investigation.

In January 1998, the Broome Airport Relocation Taskforce (BART) was formed, chaired by Transport. Membership was made sufficiently broad to cater for a wide cross section of interests, including the general community, tourism, aboriginal interests, aviation as well as relevant State Government departments and the airport owners.

This report details, in chronological order, the various consultations that have occurred with local community interests together with issues relative to environmental concerns. It should be noted that the many issues relative to aircraft operations and consultation that has occurred in this area, have not been included as they would add to the bulk of this document, and in any case, are outside the scope of this brief.

Relevant documents have been attached as Appendices.

Mervyn W. Prime
1 December 1999.

Summary of Public Consultation and Consideration of Environmental Issues

Date	Comment
22 Mar 1996	AES made a submission to the Aviation Policy Committee (chaired by the Premier), outlining the company's plans to relocate the Broome Airport.
April 1996	Dept of Land Administration (DOLA) acquires Waterbank Station, with the view (among other things) of finding a suitable site for the new airport for Broome.
1996	A Waterbank Station Coordinating Committee (WSCC) Airport Task Force is formed to look at potential sites for a new airport. The Task Force is chaired by DOLA and members include representatives from Transport, Ministry for Planning and AES, together with several technical consultants.
May 1997	Premier directs that the Transport discuss the licensing of the new airport with the Commonwealth Department of Transport.
27 Oct. 1997	DOLA released the Waterbank Structure Plan (WSP) draft report, in which are noted 10 potential sites for a new airport, with two sites (marked A and B in *Appendix C*) recommended for further investigation. Some soil testing had been undertaken at these sites.
Dec. 1997	On the 9th, 10th and 11th December 1997 a series of public meetings were held in Broome, to discuss various aspects of the WSP draft report. Notes of the meetings regarding the airport, and meetings with the Shire, and the residents of Lullfitz Drive and the Coconut Wells areas are attached as *Appendices D, E, F and G*). Generally AES were not in favour of either sites A or B and were critical of perceived lack of consultation. The Shire wanted to see the airport located away from residential areas and areas of aboriginal significance, but not too far out of the town. The Kimberley Land Council (KLC) expressed concerns that overflights by aircraft could impact on aboriginal ceremonies - in fact none of the 10 sites were considered entirely suitable by the KLC. AES indicated that it had the power to direct flight operations within 30 km of the aircraft and could deviate aircraft from areas of high significance. The potential to locate the ceremonies at an alternative site was proposed and the KLC indicated this was an option. Local residents expressed concerns that operations could impact on their lifestyles but it was pointed out that that aircraft would be much further away than they are from buildings at the present site. AES undertook to charter a BAe.146 jet airliner to make approaches into the new site so that residents and the KLC could judge for themselves if there was any potential impact.
8 Jan 1998	In view of the need to concentrate on the technical and aeronautical aspects of an airport site, the WSCC Airport Task Force was reconstituted as the Broome Airport Relocation Task Force (BART) and it was agreed that the chair should transfer from DOLA to Transport. An expanded membership would reflect the needs of the new group, and is shown, together with terms of reference, at *Appendices H and I.*
Feb. 1998	Raw data from automatic weather station near McGuigan Road indicates winds stronger and more northerly than those at the present airport in Broome.

Feb. 1998 — Discussions with National Transmission Authority (NTA) reveals it would cost $1.5 million to move their 88 metre above sea level mast from its present site. In view of this cost, flight paths and tracks would be planned to avoid this obstacle.

16 Feb. 1998 — BART's first meeting is held in Broome. At that meeting it was agreed that:

- members of the public who had made submissions to the draft WSP report, on airport issues, should be contacted and advised of BART's proposed work;
- a technical sub committee be formed to advise BART on technical issues;
- members should keep their "stakeholder groups" appraised of progress; and
- public announcements could be made through the Shire's newsletter and other means.

27 Feb. 1998 — Technical Sub Committee formed. It was agreed that airport site must:

- have room for expansion;
- be capable of 24 hour operations;
- have high visibility;
- be tourism friendly;
- be close to town;
- be capable of heavy jet operations;
- have provision for a parallel runway system;
- provide safe, efficient and viable air services;
- take into account aboriginal heritage and Native Title concerns; and
- meet environmental, planning and local governments requirements.

March 1998 — Discussions with Waters and Rivers Commission regarding potential for siting the airport on their water reserves. Agreement reached on sites other than to the north east of the production bores.

March 1998 — Shire newsletter contains details of BART and contains a contact name and number for any public enquiries. *(See Appendix J)*.

No public enquiries were received.

9 Mar 1998 — Input sought from local aviation operators on aeronautical issues and concerns.

9 Mar. 1998 — Following some slight modifications, the sites known as A and B in the WSP draft report would now be known as the "northern" and "southern" sites.

23 Mar 1998 — BART Chairman met with CEO of DEP to appraise him of the environmental issues and activities involved in the relocation of Broome Airport. As a result of this meeting a DEP representative was included in the membership of BART and the Technical Sub Committee to provide advice on environment issues.

25 Apr. 1998 — KLC advised that following anthropological assessment, clearance could not be given to undertake soil testing of potential airport "northern option" site.

28 Apr. 1998 — BART Chairman wrote to the 25 persons or organisations who had made submissions to the WSP draft report. He pointed out that their comments would be taken into account during BART deliberations and that they would be advised when BART's public consultation meetings were to be held.

30 Apr. 1998 — Premier's Department advises KLC of potential for a grant of land for ceremonial purposes, to alleviate any potential for airport impacts on existing ceremonial sites.

26 May 1998 — Meetings between aboriginal elders and BART chairman to discuss their concerns. It was agreed that due to aboriginal concerns, the "northern option" would receive no further consideration and attention would be directed towards the "southern option".

10 June 1998 KLC provided with plans of "southern option" airport layout, flightpaths, descent and climb profiles, and clearances sought to undertake further testing on this site. Further meeting sought with aboriginal custodians to keep them fully appraised of the project. This meeting held on 26 June 1998.

16 July 1998 In view of previous work undertaken on the "southern option" KLC can provide an expedited work clearance program.

16 Sept 1998 Broome Crocodile Farm writes to BART expressing concern at potential noise issues and bird strike potential, from new airport on the southern site. Meetings with farm proprietors indicating flight paths and heights, etc to relieve these concerns.

1 Oct 1998 KLC seek more detailed plans, noise levels, projected aircraft movements, etc for "southern option" and agree that Notices to Airmen) NOTAMs advising pilots to avoid sensitive areas at certain times, would be a solution to their concerns.

12 Oct 1998 It was agreed that the international flight path would be extended to the west to avoid overflights of the Coconut Wells and Willies Creek areas.

Oct. 1998 Soil testing completed on "southern site". Soil strength is not ideal but is manageable.

Oct 1998 11/29 is the preferred runway alignment as this will provide 98% availability for the new airport. To be sited much further east would result in aircraft making turns over the town and to be resited further west would bring the airport into conflict with the NTA tower.

30 Oct 1998 Meetings with aboriginal elders and KLC regarding potential flightpaths, airport siting and the like.

31 Oct 1998 AES chartered BAe.146 aircraft makes a number of flights along the proposed flight paths for the new airport, as well as runway approaches down to 200 ft above ground level. Flight was well publicised and a number of locals were positioned along the flightpath to determine potential impacts on them.

10 Nov 1998 BART advises AES of decision to move proposed runway 300 metres further east so as to assist KLC concerns, but not to move it further to the north as this might have an adverse impact on operations of the Broome Crocodile Farm, and locating further south could have adverse consequences for the Broome Bird Observatory.

Nov 1998 Noise contours prepared for the "southern" site and discussions, mainly on noise issues, held with Broome Crocodile Park and representatives from Coconut Wells and Twelve Mile areas. ANEF contours indicate that noise will be contained basically within the airport site. The closest aircraft will be is 1,000 ft above ground level and adjacent to the Park's wetlands.

1 Dec 1998 Broome Bird Observatory wrote to BART (copied to EPA) expressing concern at flight paths from the new airport and the impact that they could have on migratory birds. Expert opinion to the effect that location of migratory birds will not pose an undue problem for new airport, as current operational procedures already alert aircrew to possibility of birds in the area.
There has only been one significant bird strike at Broome - this occurred when an eagle hit an aircraft some 20 km from the airport at a height of 4,800 ft

1 Dec. 1998	Coconut Wells Ratepayers and Residents Association Inc write to BART advising that following the demonstration flight, the Association opposes the "proposed west-east landing flight path". (See discussions at the Public Meeting on 3 March 1999).
22 Dec 1998	BART writes to the Environmental Services Branch of AirServices Australia to determine means of adjusting flightpaths to avoid sensitive areas around Broome.
11 Jan. 1999	KLC provides formal work clearance approvals for southern site, together with agreement to develop the site as the new airport, subject to certain conditions. These conditions subsequently discussed and resolved with the KLC.
28 Jan 1999	More detailed noise contour maps being prepared based on the year 2002 - the very earliest the airport could be operational, and well after the noisier Fokker F.28 aircraft will have ceased operating in Western Australia. Copies of these maps will be made available to DEP as soon as possible.
29 Jan 1999	Letter to Broome Bird Observatory addressing various queries that they had raised regarding the location of the new airport and the birdlife in the region. They were also invited to participate in the public consultation meeting on 3 March 1999.
22 Feb 1999	Invitations extended to Broome Chamber of Commerce members, Kimberley Tourism Association members and other organisations to participate in the public consultation meeting.
22 Feb 1999	KLC advised that NOTAMs will be used to have aircraft avoid aboriginal sensitive areas during times when ceremonies are being held.
Feb 1999	Following his letter of 28 April 1998, BART Chairman wrote to the persons or organisations who had made submissions to the WSP draft report confirming that BART's public consultation meeting will be held on 3 March 1999 in Broome.
19 Feb. 1999	Article for Shire Newsletter supplied, detailing background to BART's deliberations and advising of date of public consultation meeting. Articles also appeared in the *Broome Advertiser* of 3 March 1999, and a number of items on the airport meeting were broadcast on local radio. Additional information can be found on Broome International Airport's website.
24 Feb 1999	Advertisement appears in *Broome Advertiser* (and repeated on 3 March) advising of the public meeting regarding the relocation of the airport. See *Appendix K*.
2 Mar. 1999	Meeting with Broome Bird Observatory to discuss concerns of aircraft noise on the rookery and waders. In fact noise impact at that point of the coast is higher from the existing airport than it will be from the new airport. Observatory to undertake studies into the flight patterns of the migratory birds as is it not known whether they currently fly over the existing airport.
3 Mar. 1999	Public Meeting held, attended by 80 persons. Notes from meeting attached as *Appendix L.*
3 Mar 1999	Public information pamphlet, showing the airport site, flight paths, aircraft heights, and a background to the relocation process were distributed at the public meeting and additional copies were available at Transport's Broome office. See *Appendix M.*

13 Mar 1999 Letter received from Ed Carroll of Coconut Wells (*Appendix N*) expressing concern at impact new airport will have on his lifestyle. An identical letter was sent to a variety of State and Federal politicians. A draft of the response from the Minister for Transport, addressing these concerns, is attached as *Appendix O.*

15 Apr 1999 Discussions between BART Chairman and President of Coconut Wells Residents and Ratepayers Association. The President's main concern was that the international flight path had been modified since the public meeting, and it was pointed out that this change had been made for operational and safety reasons. It was also pointed out that on this new track, the aircraft would be at 4000 ft and 1.5 km south of the southern most block at Coconut Wells - well outside any noise impact area. The Chairman offered to address the Association on the matter, but this offer has not been taken up.

29 Apr. 1999 Approval sought from KLC to locate a small automatic weather station at the airport site. Formal approval was given on 23 June 1999.

24 May 1999 Cabinet endorsed the relocation of the Broome Airport to an area referred to as the 'southern site' located approximately 12 kilometres north east of Broome, subject to compliance with the provisions of the Native Title Act and environmental, planning and other appropriate State statutes and also agreed to the establishment of a Broome Airport Relocation Implementation Committee (BARIC), to negotiate the sale of the new airport site.

c. June 1999 Halpern Glick Maunsell appointed as environmental consultants by AES.

18 Aug 1999 First meeting of BARIC held. Transport is Chair of committee.

19 Aug 1999 Formal request made to DOLA to compulsory acquire land, including requirements of the Native Title Act, for the site of the new airport.

26 Aug 1999 Meeting with Chairman of EPA to appraise him of BART actions and site selection process and to enquire actions required to progress environmental process.

26 Aug 1999 Meeting with CEO Ministry for Planning to progress amendments to Broome Town Planning Scheme. to allow for new airport and zoning of adjacent industrial land.

Note : Both Ministry for Planning and Department of Environmental Protection have been kept fully aware of all actions taken to progress the relocation of the Broome Airport through full participation in BART, and in the case of DEP, also through membership of the Technical Sub Committee.

Glossary

AES Airport Engineering Services Pty Ltd. (the owners of Broome Airport). The name was changed to Broome International Airport Holdings Pty Ltd in June 1998.

ALOP Airport Local Ownership Plan. (The process by which the Commonwealth transferred ownership in many regional airports, to local interests).

ANEF Australian Noise Exposure Forecasts. (Contours drawn on a map around an airport, showing the forecasted noise levels which might be expected in the future).

BARIC Broome Airport Relocation Implementation Committee. (The State Government committee which followed on from BART, and charged with undertaking the processes for transferring the land for the new airport, to AES).

BART Broome Airport Relocation Taskforce. (The State Government committee charged with determining a site for the relocation of the Broome Airport).

DEP Department of Environmental Protection. (The State Government agency charged with the protection of the environment, and which makes recommendations on development proposals to the Environment Protection Authority).

DOLA Department of Land Administration. (The State Government Department which controls Waterbank Station and is responsible, in the main, for the control of State owned land. DOLA was also the responsible agency for the Waterbank Structure Plan).

EPA Environment Protection Authority.(The five member "board" to which the Department of Environmental Protection makes recommendations and provides advice on various development proposals).

KLC Kimberley Land Council. (The body representing the various aboriginal groups in the Kimberley region).

NOTAM Notice to Airmen. (A notice issued to all aircrew advising them of specific issues, such as runway repairs that might exist at a particular airport, or specific manoeuvres which might be banned at a particular airport for some reason).

NTA National Transmission Authority. (The Commonwealth agency which owns and operates the 88 metre high transmission tower located to the north east of the Broome townsite).

Transport Department of Transport. (The State government agency responsible for transport issues in Western Australia).

WSCC Waterbank Station Coordinating Committee. (The Committee, initially chaired by DOLA, but later by the Shire of Broome, charged with coordinating the various parties with an interest in the development of Waterbank Station and preparing the Waterbank Structure Plan).

WSP Waterbank Structure Plan. The plan developed by the Waterbank Station Coordinating Committee, proposing to Government the uses for which the land comprising Waterbank Station should be put).

Persons and Organisations contacted during the process

Aboriginal elders and custodians

Airlines (Ansett, Qantas, general aviation interests, etc)

Airport Engineering Services Pty Ltd

AirServices Australia

Broome Bird Observatory

Broome Chamber of Commerce

Broome Crocodile Farm

Civil Aviation Safety Authority

Coconut Wells Ratepayers and Residents Association

Commonwealth Department of Transport

Department of Environmental Protection

Department of Land Administration

Environmental Protection Authority

Lullfitz Drive residents

Kimberley Development Authority

Kimberley Land Council

Kimberley Tourism Association

Media Interests (local radio, TV and newspapers)

Meteorology authorities

Ministry of Premier and Cabinet - Native Title Unit

Ministry for Planning

National Transmission Authority

Shire of Broome

Waters and Rivers Commission

Western Australian Tourism Commission

Members of the Broome community and local organisations

Meetings in Broome regarding relocation of the airport (and Waterbank Structure Plan) December 10 and 11, 1997

Public Meeting - Lotteries House 7 pm Wed. 10 December (attendance 53 persons)

- Chaired by Chris Williams, Director Land Operations Division, DOLA

- Presenters :
  Denis Millan, Manager, Projects and Liaison, DOLA
  Andrew Forte, Forte Airport Management
  David Pentelow, Consultant, Waterbank Station Co-ordinating Committee
  Peter Driscoll, Planning Consultant, Waterbank Station Co-ordinating Committee

- **Andrew Forte** gave details of the processes involved in the selection of the airport sites. Such criteria included safe operations, suitable land availability, closeness to town, aircraft noise impacts, adjacent land uses, engineering issues, meteorological issues, drainage, geological nature of the land, etc.

  106,000 wind readings taken over a 40 year period were used to determine the best alignments for runways. It was admitted that the temperatures at some of the "inland sites" could be 2 degrees warmer than on the coast, but this would not have a major impact on operations.

  The OTC tower is 88 metres in height. Sites A and B are both sound, with site A being slightly better.

- **Ron Buckey**, on behalf of Wallace Emery, said the company wished to place on record the following facts :

  - the company had not been consulted in the site selection process for sites A and B;
  - the process needs many months of consideration to "get it right";
  - the company believed many of the sites were inappropriate - must get it right first time;
  - the date used in the process was either inaccurate or not comprehensive enough;
  - site B could be temperature affected;
  - the sites would impose major costs and restrictions on tourism (especially site B)
  - the company wants to get back to the Task Force to select an appropriate site and have full consultations on the issue; and
  - some of the sites are too far out of town and would inhibit tourism.

- **Angus Murray** (Shire President) advised that the council has had major consultations on the preparation of the draft plan. The Shire agrees with the major issues in the Structure Plan, but has some concerns, including :

  - the 5800 ha horticulture region is not large enough;
  - the first expansion of the town should be east of Coconut Well (but this could be 100 years away);
  - need a larger area than 34 ha for tourism projects north of Willie Creek;
  - agree with the retention of Buckley Plain for aboriginal heritage purposes;
  - don't want to see planes flying over residential areas or areas of aboriginal significance;
  - the Shire does not intent to comment on technical issues relative to the airport such as wind, direction, temperature and the like; and
  - the Shire does not want to see the airport located too far out of town.

- **Lady** - the new airport should cater for both the current town and the proposed new town.

- **Trevor Tough** (Hertz) made the following points :

  - his company was not consulted about the sites for the new airport;
  - if the airport was close in, it could be serviced for hire cars, from the town depot;
  - if too far from town he would have to duplicate services and employ extra staff. He estimated it would cost $140,000 to duplicate his service at the airport plus he would need to employ one full time staff member and two part time cleaners. It could cost $270,000 in the first year;
  - lack of consultation could cost stakeholders a fortune to service the new airport; and
  - he asked whether leaving the airport at it's present location was an option. He was told it was, if all of the other options "fell over", but this was unlikely.

- **Wayne Howard**, Horticulturalist, located in the "12 Mile" horticultural area, commented:

  - about 50 residents at the 12 mile could be affected by airport operations, and he had not been contacted; and
  - the airport will have a major impact on their lifestyle as they are a rural residential community.

- **Don Muller** (pilot with Pearl Aviation)

  - has concerns at thunderstorm activities in the wet season, the present airport is on a peninsula and misses many of the thunderstorms which move inland - yesterday a prime example, no rain in town but plenty at Coconut Well and the 12 Mile. The temperatures at 12 Mile are 2 degrees hotter than town and it gets more rain;
  - would need to carry extra fuel (adding to costs) to cater for holding in the wet, as sites A and B are in the "thunderstorm belt"; and
  - it would be better to leave the airport at the present site, rather than move it (from a pilot's point of view).

- **Kevin Thomas** (Aerodrome Services)

  - the G and H sites are preferable as they take off and land over the ocean or the reserved water table where no one lives and aircraft won't disturb anyone; and
  - the bird sanctuary adjacent to site A could see increased aircraft bird strikes.

- **Denis Millan** (DOLA)

  - suggestions to shift the OTC tower would cost $1.5 million, but suitable sites can be designed around it;
  - aboriginal heritage issues and native title issues have been a major impediment in not shifting the airport to date, but they is a need to reserve a site now so that it is available in the future;
  - there is a need to protect the airport site by ensuring planning for compatible land uses adjacent to the site;
  - the draft structure plan is only a discussion paper and public submissions and comment is required by 30 January 1998; and
  - in answer to a query about locating the sewerage works on the main road, it was pointed out that the area could be disguised by trees.

- **Ron Buckey** (Wallace Emery and Associates)

  - the company has a Heads of Agreement with the Shire which requires them to relocate the airport.

- the cost to relocate the airport is in the region of $30 to $40 million;
- planning the relocation must commence in 1998, with initial spending commencing in 1999;
- the company is currently selling off airport land to help finance the move which will occur in the next 5 to 6 years.

- **Unknown**

  - "4 Mile" residents could be in the flight path from a new airport. A mail drop should be organised to inform them. Perhaps all Broome residents should be mail dropped.

- **Chris Williams** (Chairman)

  - participants thanked for their attendance and urged to provide written comments on the Structure Plan; and
  - advised that their comments at tonight's meeting would be taken into account

The meeting concluded at 10 pm.

Meeting at Broome Shire Council Chambers with Shire, Kimberley Land Council and Wallace Emery Representatives at 10.30 am on Thursday 11 December 1997

Andrew Forte gave a background to the airport site election process (see comments from public meeting)

Ron Buckey made a statement as follows :

- the company had made an agreement with the Shire to relocate;
- the company was not consulted regarding the selection of sites A and B;
- the runway alignments are not suitable for light aircraft operations, the alignment should be further north;
- temperature is a concern at site A;
- there are safety problems at site A due to the wetlands and potential bird strikes;
- site H was originally preferred by the company due to noise impacts, but F and G are acceptable;
- higher operating costs as site B could inhibit tourism;
- higher temperatures at inland sites could jeopardise non-stop flights to Perth, as aircraft may need to refuel en-route;
- the company is currently negotiating with Merpati and Silkair to service Broome;
- the company offers to charter a BAe.146 jet to fly over the aboriginal heritage areas to show the Ribbibi people that there is minimal or no impact to their ceremonial lands;
- a new greenfield airport site should allow full unrestricted operations from day 1;
- the company would consider site A if it were rotated to 10/28 or 11/29;
- if there was a cost-benefit in removing the tower, the company would pay the $1.5 million to do this;
- site A has commercial benefits for the company and safety is the only concern • a slight realignment would make them happy;
- the site needs to be designed for a 2500 m runway with provision for a parallel runway if needed.

Dr Patrick Sullivan (Anthropologist on behalf of the Kimberley Land Council)

- there are two distinct aboriginal ceremonies around Broome each year, although they may not be held some years and there could be a gap of 5 or 6 years.

  The first involves an all night sing-song on stories of the land, which is part of the initiation of young men which is essential that it not be disturbed by aircraft noise or any other activity.

  The second relates to the seclusion of the initiated young men, for a period of 3 to 4 months, during which time they cannot be approached or seen by anyone. There is concern that they could be seen by people in overflying aircraft, and this would be considered dangerous for the young men. *(At present there is no restriction on flights over the Buckley Plains area, and light aircraft already traverse the area !)*

- Many of the sites previously available to the aboriginal community are no longer available due to development around Broome.

- The impact of airport activity is incompatible with aboriginal ceremonies and if not handled sensitively, local aboriginal activity will cease to exist.

- Oversight of these activities is a major concern. Depending on aircraft height, the distance a person could see from the plane could be a number of kilometres !

- There doesn't appear to be an easy solution as none of the 10 sites are ideal.

- The Shire asked whether these aboriginal areas could be located to another area, such as north of Willie Creek. Dr. Sullivan commented that the aboriginal people are extremely practical.

- The current airport affects aboriginal ceremonies, but the local people have learnt to live with it. The preference would be to leave the airport where it is, or move it well inland away from the coast.

Mike Caplehorn

- Roebuck Estate sub-division is the 'engine' to move the airport and first sales will occur in March 1998. It is either move the airport or upgrade the existing one at a cost of $10 million.. Must do one or the other by 1999.

- The Shire is keen to see the airport moved, and if money is spent upgrading the existing airport, it will be more difficult to make a move in the future.

- It is essential that compromises be made by all parties to ensure actions are taken will meet everyone's needs.

- The airport owner is empowered to control flights within 30 km of the airport and if necessary he could stop flights over areas of high sensitivity.

- Perhaps the answer may be to designate a specific aboriginal ceremony site and have it permanently zoned as such so that no future development will impact on it.

- Kim Male made the point that the original push to move the airport was made about 15 years ago on planning grounds, there was no community push for the move.

David Lowery (Legal representative for the Kimberley Land Council)

- Perhaps it may be possible to sterilise the flightpaths over sensitive areas.

- It is not possible to move the aboriginal ceremony site too far away as it would then encroach into another group's area.

David Pentelow (Consultant, Waterbank Structure Plan Committee)

- The Government may be able to provide a ceremony site that will be permanent and an option for the airport could "fall out" of the exercise. Patrick Sullivan agreed that it might, but it won't be easy.

- The company was asked whether a 40 year forecast for aircraft movements at Broome could be provided. Mike Caplehorn undertook to see what could be supplied.

Denis Millan

- There are three specific actions to be undertaken :

  - the overflight by a BAe.146 to test reaction to certain areas to be arranged.
  - identification of sites of sensitivity to aboriginal heritage to be arranged.
  - aeronautical engineer to be employed by DOLA to work with Andrew Forte to progress sites.

Dr. Patrick Sullivan

- Will be overseas until mid February 1998 and it is also a busy time for aboriginal ceremonies, so will not be able to meet the public comment deadline of 30 January 1998. It could be March or April before these things could be looked at.

- Denis Millan responded that it was essential for the study to continue as soon as possible after the public comment phase was over, but in view of the vital input from the aboriginal community, DOLA would have to work around the issue until the submission came to hand.

Meeting at Broome Lotteries House with residents of the Lullfitz Drive area, at 3 pm on Thursday 11 December 1997

Andrew Forte gave a background to the airport site election process (see comments from public meeting), with emphasis on the site A proposal as this was the one most likely to impact on the Lullfitz Drive residents.

He advised that site J was too far from town and this might also apply to site I. Only sites A and B had been thoroughly tested as these were the only two which works programme approvals could be obtained from the aboriginal community.

He made the point that aircraft would be at least 2000 ft above the Lullfitz Drive area and there would be no noise impacts as the area was well outside the 20 ANEF contour.

Ron Buckey

Aircraft are becoming quieter, the most likely replacement for the BAe.146 which is exceptionally quiet is the Boeing 737, which is also a quiet aircraft, although perhaps not quite as quiet as the 146.

Ansett will be commencing a weekly MEL - BME - MEL flight in April 1998.

To date there have been 18 flights by Boeing 767s into the existing Broome airport.

Traffic growth into Broome is currently about 5% per annum.

General

All concerns expressed by residents related to potential aircraft noise impacts with a resultant deterioration in lifestyle.

Denis Millan gave assurances that there will be consultations with all interested parties prior to any final decisions being made.

Meeting at Broome Lotteries House with residents of the Coconut Well area, at 4 pm on Thursday 11 December 1997

Andrew Forte gave a background to the airport site election process (see comments from public meeting), with emphasis on the site B proposal as this was the one most likely to impact on the Lullfitz Drive residents.

He advised that there is no preference for any particular site at this stage, and all will be worked through to determine the best site. He said that tourism interests had rejected both sites A and B. B being too far out of town and A having the wrong alignment for light aircraft operations, which are a major part of tourism activities. They also had concerns on the impact wind and temperatures would have on operations.

He mentioned that from the comprehensive wind data obtained, site A on an alignment of 08/26 with a cross wind factor of 10 knots would have a useability of 96.04%, and with a 15 knot factor this would rise to 96.97%. Using an alignment of 10/28 (the same as the current airport) the useability factor at 10 knots would be 97.35% and at 15 knots would be 99%. He said the study team were flexible on the final alignment for the runway.

There was some dissent amongst the residents with some accepting certain sites whilst others rejected those same sites.

The point was made that thunderstorms were prevalent inland and this could impact on aircraft operations.

Houses at Coconut Well are of open design as there is no power and few air conditioners. This open design living would increase aircraft noise impacts.

Graeme Macarthur suggested that site H with right hand (southern) circuits would not cause a problem, but another resident disagreed and suggested that there would be a major drainage problem as floodwaters rushed through the area. It was suggested that if necessary, drainage engineers could address the problem.

Ron Buckey indicated that Wallace Emery were willing to charter a jet to make missed approaches over the airport sites for residents to see first hand the minimal noise impacts that would occur.

Site G seems to be ideally located for many Broome residents, but there could be aboriginal heritage problems with the site. Residents at the southern end of Coconut Well have concerns at sites H and B.

Denis Millan gave an undertaking of further consultation with interest groups as consideration of the various sites progressed.

Appendix H

Broome Airport Relocation Taskforce - Members and Proxies

Chairman

Nick Belyea	Director - Aviation Policy	Department of Transport

Deputy Chairman

Denis Millan	Manager Projects and Liaison	DOLA

Members

Greg Powell	Shire of Broome
Angus Murray	Shire of Broome
Terry McVeigh	W A Tourism Commission
Ross McCullough	W A Tourism Commission - Broome
Eugene Ferraro	Ministry for Planning
Geoff Gooding	Kimberley Development Commission
Shane Sadlier	Department of Environmental Protection
David Lavery	Kimberley Land Council
Graham Higgins	DOLA - Kimberley
Ron Buckey	Airport Engineering Services Pty Ltd
Mike Caplehorn	Airport Engineering Services Pty Ltd
Marcus Richie	Broome Aviation
Ray Patterson	Department of Transport - Broome
Merv Prime	Department of Transport (Executive Officer)

Proxies

Lou Sauzier and Rob Menzies	Airport Engineering Services Pty Ltd
George Irving and Kimbal Barrett	Kimberley Land Council

Broome Airport Relocation Taskforce (BART)

Terms of Reference

1. To co-ordinate the activities of relevant State and Local Government agencies, the present airport owners, relevant community groups and other interested stakeholders in order to determine the most appropriate site for a new airport to serve Broome and the Kimberley region.

2. Actions will be taken to ensure that :

   - the new airport provides for safe, efficient and viable air services for both RPT and general aviation operations;
   - it takes into account the needs and aspirations of the local community including the viability of local infrastructure and industry;
   - the airport site should be capable of sustaining very heavy jet operations and have provision for a future parallel runway and associated facilities;
   - the airport site compliments local and State planning requirements; and meets all relevant environmental and other legal requirements;
   - the airport facilitates the growth of industry, including tourism and regional exports;
   - the airport takes into account relevant aboriginal heritage and native title concerns;
   - it provides increasing opportunities for both international and domestic travel, to from and within the region; and
   - to deliver an outcome on a preferred site for a new airport by no later than 30 June 1998.

19 March 1998

Shire News

SHIRE OF BROOME NEWSLETTER
PO BOX 44, BROOME, WA 6725 . PHONE 9192 1202

THE PEARL COAST

MONTHLY . MARCH 1998 . NO. 43
FAX 9192 1891 . PUBLISHERS MAGNOLIA ASSC

BROOME WELCOMES NEW RESIDENTS

Broome Shire Council and the Broome Chamber of Commerce have successfully lobbied Western Metals for staff on its new mine Pillara, to fly in and out of either Broome or Derby. Last week Council and the Chamber showed 20 new recruits around Broome and presented them with information packages. It is expected that approximately 80 families may choose to live in Broome. The first of our new residents will arrive in Broome within three weeks.

With near perfect timing, it would appear that the Department of Land Administrations Residential Subdivision 5B is about to be released, together with the recent launch of 48 residential lots on the northern portion of the airport land, has ensured the availability of land for residential development.

Shire President Angus Murray speaks at the launch of Roebuck Estate residential subdivision.

VERGE SLASHING

Residents are advised that Council's verge slashing programme is proceeding as quickly as resources allow, however, not all areas can be mowed at once. Priority is being given to areas such as street corners for sight distance, near schools, main approach roads and dual use paths. Other streets will be given one main slash as equipment becomes available and dependent upon the weather, this could take some time.

Council encourages residents and businesses to carry out slashing or mowing of their own verges to assist the beautification and general appearance of Broome.

TIDY WA IN MAY

Due to the inclement weather and trying conditions in March, Council did not participate in 'Clean Up Australia Day' this year.

However, the Keep Australia Beautiful Council in WA has proposed a 'Tidy WA in May' day for the state on Sunday 24th May 1998 which Council will participate in. As it is close to the major tourist influx and the conditions are amenable to outside activities it is considered a more appropriate time for an event of this nature in this part of the state. For details on how you may take part please contact Ken Lowth on 9192 1202.

A NEW AIRPORT FOR BROOME

The days of jets flying overhead Chinatown are numbered, with the recent formation of Taskforce to determine a location for a new airport. The Broome Airport Relocation Taskforce (BART) is chaired by the Department of Transport and has representation from a number of State Government agencies, the Shire, the Kimberley Land Council and Wallace Emery and Associates (the present airport owners).

Two main potential sites to the north and east of Broome are being examined and the public will be consulted before any site recommendation is made to Government. It is anticipated that public meetings will be held in Broome in mid-May, to give residents the opportunity to voice their opinion on the sites.

In addition to the public meetings, BART also has access to the written submissions made in relation to the Waterbank Structure Plan, as a number of those comments related to the proposal for a new airport. These comments will be taken into account by BART in its deliberations.

BART's Executive Officer, is Mr Merv Prime, Department of Transport, Perth, phone (08) 9320 9731 or fax (08) 9320 9734.

Public Notices

Public Meeting

Broome Airport Relocation

The Broome Airport Relocation Taskforce will be holding a public meeting in Broome to make a presentation on the proposed site for the new airport. The public is invited to attend this presentation, which will be held at:

Lotteries House
Cable Beach Rd, Broome
at 8.00pm Wed. 3 March 1999

Further Enquiries: Ray Patterson Transport, Broome Phone: 9193 5923

TRANSPORT

Passenger numbers on increase

BROOME is one of WA's fastest growing tourist destinations with the highest growth in visitor numbers for the 1998-99 financial year than ever before, according to Ansett Australia.

About 70 per cent of all air passengers visiting Broome come from the ever-increasing eastern states market.

Ansett WA and Northern Territory regional director Chris Barnes attributed a rise in eastern states travellers to the introduction in August last year of a weekly Boeing 737 service to Broome from Melbourne, with connections from all major eastern seaboard cities.

"Research conducted at Broome airport has shown that more than 90 per cent of all people interviewed were first time travellers to the town and they would return for a later visit, and refer Broome as a destination to their friends," he said.

"This is confirmation that Ansett is on target with its operational and marketing initiatives and reflects favourably on the quality and range of holiday options that local ground operators now provide in Broome," Mr Barnes said.

Airport relocation

BROOME residents will hear the details of the proposed relocation site of the Broome airport at a public meeting tonight.

The Broome Airport Relocation Taskforce will make presentations on the proposed site for the new airport, about 10km out of town.

Taskforce chairman Nick Balyea said the meeting enabled the long-term Broome residents to see what had gone into the relocation plans.

"The airport is fundamental to the growth of the town," he said.

"The presentations will be made on the site we've selected after looking at all the technical analyses."

Test run approach and departure routes were flown over the proposed site on October 31, to trial the new flight paths.

The site was south of the road to Derby, near the Cape Leveque turn-off.

Mr Balyea said the new airport would get international status, with flights initially flying to Bali and Singapore.

National Jet stopped its international service from Broome in February 1997. The public meeting is at Lotteries House at 8pm.

Notes of a public meeting held at Lotteries House, Broome, at 8 pm on Wednesday 3rd March 1999, to discuss the relocation of the Broome Airport.

1 This meeting had been widely publicised by means of Public Notices in the local press, local radio announcements, media reports, personal invitations to specific interested parties and local community groups. It was conducted under the auspices of the Broome Airport Relocation Taskforce (BART) and attracted an attendance of 80 persons (13 BART Members and 67 members of the public).

2 The format of the meeting was presentations by nominated BART members, with questions being invited from the audience after each presentation.

Nick Belyea, Chairman of BART and Director Aviation, Department of Transport.

3 Mr Belyea welcomed everyone to the meeting, pointing out that the new airport was arguably the most important piece of transport infrastructure for Broome and the Kimberley, and it would cater for tourism, business and community needs well into the future.

4 He advised that the airport is a key regional airport with untapped potential, and outside of Perth sits very high in terms of developing international and domestic air traffic. It was vital that the airport is developed in a planned manner to meet future growth potential

5 He said the Government was involved in the process as the site was on Crown Land and many agencies had an interest in the new airport. A team approach seemed the most logical way to proceed.

6 Mr Belyea pointed out that Broome International Airport Holdings Pty Ltd., would eventually take ownership of the new site, under commercial terms negotiated with the Government. The airport was strategic infrastructure vital to the State's transport system.

7 He advised that BART was a sub-committee of the Waterbank Structure Plan Committee (chaired by Angus Murray), and the new airport was part of the overall Waterbank Plan.

8 The selection process had commenced in 1998 and had taken 12 months to reach this stage and he thanked each member of BART for the sterling work that they had put into the project. It had been a very co-operative process, with a technical sub-committee running in tandem with BART.

9 Mr Belyea pointed out that consultation had been one of the key objectives of BART to ensure there was transparency of process, and tonight's meeting was another plank in that consultation process. He said it was important that the Broome community share in the development of the new airport and take ownership in its growth.

10 Mr Belyea stated that with a new airport it was important to get the site right the first time, as it was unlikely it would be moved again for very many years, and to this end the technical processes involved with the selection had been excellent.

11 The format of the evening's program was then outlined by Mr Belyea, and he asked that questions be held until the conclusion of each speaker's presentation, and that questioners identify themselves. He stressed that questions were welcomed and he encouraged the audience to ask whatever questions they wanted answers on.

12 ***There were no questions of Mr Belyea.***

Angus Murray - BART Member, Chairman of Waterbank Structure Plan Committee and President of the Shire of Broome

13 Angus Murray outlined the background to the Waterbank Study and pointed out that 3,000 of Broome's 10,000 population were under 18, and it was essential to plan for their future needs and provide for future growth.

14 He said the Structure Plan contained some fantastic proposals and was looking at providing something for everyone. It was a Plan of consensus - the KLC was being protected, the environment was being protected, and there was a mature balance to meet all needs and to cater for the future growth of the town. It was great for Broome.

15 He stressed that BART had a wide range of issues to consider in selecting the airport site and it had addressed these issues, but with some, some compromises had to be made.

16 One of the first things to come out of the Structure Plan will be a site for the new airport, which will secure Broome's economic future.

17 ***There were no questions of Mr Murray.***

Mr Ron Buckey, BART Member and CEO of Broome International Airport Holdings Pty Ltd.

18 Mr Buckey pointed out that his company had purchased the Broome Airport in 1991 and part of the agreement at the time was that the airport should be relocated to a new site. He said his company had spent $5 million on improvements to the current airport.

19 The present airport has had 18 Boeing 767 charters since the company purchased the property and the runway has a limited life for heavy aircraft operations. Last year there were 250,000 passenger movements at Broome (including transits) and this number is increasing.

20 He said Ansett have operated Boeing 737 aircraft into Broome, and this will be the primary aircraft of the future. In addition, many resource groups were now using the airport.

21 His company was looking to attract another air service to South East Asia, and many Europeans were now coming to Broome due to major W A Tourism Commission campaigns now undertaken.

22 He said future aircraft using Broome will be quieter than the F.28s, which will be phased out during 1999. By the time the new airport is operational there will be more B.737 and A.320 aircraft using Broome with Boeing 767 aircraft being used for long-haul routes. The land at the end of the runways would need to be quarantined to avoid future noise problems.

23 Mr Buckey pointed out that the new airport would cost some $ 40 million to construct, and this would be a major boost to Broome's economy as it would attract many more tourists to the region.

24 ***There were no questions for Mr Buckey.***

Mr Ellis Kiel, Aviation Consultant to BART

25 Mr Belyea gave details of Mr Kiel's background, pointing out that apart from his vast aviation and airport experience, he had previously been the General Manager, Technical and Standards, for all FAC airports in Australia.

26 Mr Kiel gave details of the BART Technical Sub Committee and indicated that it was now finalising the site selection process and pointed out the owners will still have further work to undertake before an airport could be built.

27 Mr Kiel gave a comprehensive report on the technical aspects of the new airport and the site selection process. His presentation was accompanied by a series of overhead slides.

28 The format of Mr Kiel's presentation was as follows :

- The Existing Broome Airport (Disadvantages- in the middle of town; approaches and take offs over built up areas; and noise potential)
- Broome Land Development 1997 (program recognised the need to shift)
- Government Decision to Purchase Waterbank land lead to Waterbank Study
- What is an aerodrome ?
- Formation of BART and the Study program
- Site selection factors and the result
- Typical types of aircraft to use the new airport
- Noise contours / Approach / Take Offs / Flightpaths

29 Among the many issues canvassed in Mr Kiel's comprehensive presentation relative to the site selection were:

Environmental and Heritage
- air quality
- water quality
- flood potential
- flora
- fauna
- heritage
- minerals
- disruption
- noise
- birds
- possible future land use.

Access
- aviation services
- private vehicles
- public transport

Operations
- airspace
- wind coverage
- useability
- other meteorological conditions
- site flexibility (obstacle clearance surfaces / approach and take off paths)
- aerodrome limitations (temperature / thunderstorms / migratory birds)

Costs
- site acquisition
- site preparation
- to re-establish
- to support operators
- infrastructure (runways / terminals / services / nav. aids)

30 Following Mr Kiel's presentation, the following questions were asked :

31 ***Question from Elsta Foy, Shire Councillor and member of Yawuru Corp.***

32 *Ms Foy asked why the Yawuru Corporation had not been consulted as they currently occupy Wattle Downs Station, and a small segment of the property appears to have been included in the airport site.*

33 *Denis Millan responded, pointing out that the whole area is Crown Land and there have been intensive discussions with the KLC . Mr Millan indicated that until the site had been formally approved and the boundaries precisely defined, BART was not in a position to talk to all interested parties. He indicated that he will speak further with Ms Foy following the meeting.*

34 ***Question from Phillipa Cooke, resident of "Four Mile".***

35 *Ms Cooke indicated that there were about 40 aboriginal families with 5 acre lots living at the "Four Mile" and she was concerned about potential noise impacts, but more concerned about road safety on the Broome Road, as it is used as a speedway at present. She wanted the road improved and asked whether residents would be relocated ?*

36 *Nick Belyea responded saying that the "Four Mile" was well outside the noise impact area from the airport, and residents would not have to move. He indicated that if the road was to carry more traffic as a result of the new airport, it would probably have to be upgraded.*

37 ***Question from Ed Carroll, Schoolteacher and Resident of Block 103, Coconut Wells***

38 *Mr Wells advised that during the BAe.146 demonstration flight, the aircraft made its approach from a much more northerly point than the flightpaths shown on the map. He said that whilst consultation had been good, ANEFs developed for southern cities didn't apply in Coconut Wells, as his house there didn't have windows or insulation.*

39 *He said that during the demonstration flight, there was 52 seconds of aircraft noise and he had difficulty speaking to another person only 1 metre away. (An unidentified voice made the point that he lived much closer to the flight path of the existing airport and had no problems with aircraft noise).*

40 *Ellis Kiel responded, pointed out that as the demonstration aircraft had taken off from the existing airport, it had to make a wide circuit to join the track for the new airport and thus would have appeared from a point further north, than would have been the case of an aircraft arriving from Bali. However, if the Bali track was going to be a problem it may be possible to modify it.*

41 *Nick Belyea made the point that BART looked at safe and efficient tracks for the airport, and any fine tuning can be done during the environmental phase.*

42 ***Malcolm Douglas, Crocodile Farm Proprietor,*** *queried what the yellow circle on the plan was around the airport. He was informed that this was the circuit path for light aircraft using the airport, and was shown to give an indication of traffic patterns using the planned future parallel runway for light aircraft.*

43 ***Liz Rosenberg, Resident of the "Twelve Mile"*** *(PO Box 135, Broome) asked at what height aircraft would be as they flew over the "Twelve Mile".*

44 *Nick Belyea indicated that he did not know, but promised to obtain the information and relay it back to her.*

Shane Sadlier, Department of Environmental Protection

45 Shane Sadlier advised that the role of the EPA was to advise Government on environmental issues. He then outlined the likely environmental process for the new airport site.

46 He indicated that noise could be a major environmental issue and that other issues could include flora, fauna, surface pollution and the like.

47 ***There were no questions of Mr Sadlier.***

Terry McVeigh, BART Member and General Manager - Regions, W A Tourism Commission

48 Terry McVeigh spoke of Broome's tourism potential, pointing out that it was one of the State's tourism jewels. He said the airport was essential infrastructure for tourism's future and would provide a strategic gateway to the region.

49 There needed to be a 20 year vision to ensure that tourism grew in an orderly fashion. There are 3087 'tourism beds' in Broome and air access is essential to fill them.

50 ***There were no questions of Mr McVeigh.***

Denis Millan, Deputy Chairman of BART, Department of Land Administration

51 Mr Millan outlined the process to be undertaken, which included the preparation of two Cabinet Minutes (the second on the Waterbank Structure Plan). He noted that the new airport site is a key strategy in the overall WSP.

52 There will then be a need to go through the Native Title process, following the sign off to the site by Cabinet, and then other statutory processes will follow.

53 ***The following questions were then raised -***

54 ***David Dureau - Camel Driver*** *asked why had the airport process been so transparent, yet the negotiations on Gantheaume Point had not been. Denis Millan indicated there had been sensitivities with the Gantheaume Point project.*

55 ***Elsta Foy - Shire Councillor*** *asked why the KLC had not kept all parties (eg the Wattle Grove people) aware of the negotiations. George Irving of the KLC responded that the KLC had been part of BART and discussions had been held, and further discussions will be ongoing.*

56 ***Graeme Gimms*** *asked whether a 5 to 7 year timeframe was appropriate to build the airport or whether it should be fast tracked. Terry McVeigh responded saying that the timeframe was realistic bearing in mind the additional processes that had yet to be undertaken. He also pointed out that the facilities at Exmouth had been put in by the military and there was a strategic need to fast track that process.*

57 ***Warren Bunt*** *pointed out that all members of BART were local people and asked whether the aircraft would meet Commonwealth standards. Nick Belyea responded that it did meet both CASA and ICAO standards.*

58 ***Terry McGwin*** *asked whether the runway alignment could be moved south by 10 degrees to avoid the Coconut Wells settlement. Ellis Kiel pointed out that the present flightpaths are*

presently well south of Coconut Wells, and the most the track could be moved would be 2 or 3 degrees.

59 One genetleman made the comment that he lives 500 metres from the present airport and he has no problem with noise.

60 Nick Belyea thanked everyone for their attendance and input to the process and stressed how important the transparency of process had been.

Broome International Airport

The Future

Over the last twelve months there have been intensive studies on the relocation of the existing Broome Airport out of the town area to a greenfield site close enough to continue to be a convenient location for all of Broome residents to use and enjoy.

In the 1997-2000 Land Development Program for Broome, prepared by the Ministry for Planning it was recognised that relocation of the existing airport would provide major growth opportunities for the town.

The Waterbank studies outlined in excess of 10 possible sites (which were presented at a series of public meetings in December 1997). Following more detailed consideration, it is proposed to concentrate on a site approx. 12 km from the centre of Broome, to the south of the Broome-Derby road and east of the Beagle Bay - Cape Leveque road.

This site allows for one main runway of initially 2,700 metres in length, allowing for unrestricted Boeing 767.300 operations, (with further extensions of up to 3,500 metres to allow for Boeing 747 aircraft) and a future short parallel runway for light aircraft - terminal buildings are planned in the traditional Broome style.

The owners of Broome Airport are currently working with Government and other bodies to develop a proposal which :

- will provide safe and efficient air services for the people of Broome;
- compliment State and Local Government planning requirements;
- takes into account relevant aboriginal heritage and native title concerns;
- meets all relevant environmental and regulatory requirements; and
- takes into account the needs of the local community.

The next stage is that the proposal will be submitted to the processes required by the Department of Environmental Protection and the Environmental Protection Authority.

Construction is estimated to cost approximately $ 40 million and will be phased over approximately five to seven years.

The new International Airport is an exciting project planned to be an important part of Broome's development into the 21st century.

Broome Airport
Relocation Taskforce

Broome International
Airport Pty Ltd

Broome Airport Relocation Taskforce (BART)

Membership

Nick Belyea	Department of Transport	(Chairman)
Denis Millan	D.O.L.A.	(Deputy Chairman)
Angus Murray	Broome Shire President & Chairman Waterbank Committee	
Greg Powell	Shire of Broome	
Ron Buckey	Broome International Airport Ltd	
Rob Menzies	Broome International Airport Ltd	
Shane Sadlier	Dept. of Environmental Protection	
Terry McVeigh	W A Tourism Commission	
Ross McCullough	W A Tourism Commission - Broome	
Jeff Gooding	Kimberley Development Commission	
Eugene Ferraro	Ministry for Planning	
David Lavery	Kimberley Land Council	
Brent Hanson	representing General Aviation	
Ellis Kiel	Aviation Consultant	
Merv Prime	Department of Transport (Executive Officer)	
Ray Patterson	Department of Transport - Broome	

Att:___

RE: BROOME AIRPORT RELOCATION

Dear Sir/Madam,

I am voicing my disapproval of the recommended site for the Broome Airport relocation as flight path landings and take-offs will pass close to my place of residence and aircraft noise shall impact greatly.

Trial flights undertaken in late 1998 have further heightened my fears and I find it utterly incomprehensible that such a development can be considered when it disregards existing residents.

The airport relocation process began in a well ordered and thorough manner where the public was well educated into complexities of the task. However of late the relocation process effort appears substandard resulting in diminishing consultation and naming a recommended site that largely ignores the previous submissions of a group of residents.

There appears little doubt that those who live on elevated rises on the southern end of the Coconut Well area will be impacted significantly by noise. Perhaps somewhat similar to those who live in some areas of the Darling Scarp near Perth where aircraft noise is a major concern.

The situation is further exasperated as Coconut Well houses are mostly open living-designed houses aimed to catch coastal breezes. Unfortunately by catching breezes they also catch noise.

I live eleven kilometres from present flight paths and clearly hear aircraft when south breezes are blowing. On some occasions I can be woken from my sleep by the aircraft.
Despite detailing these facts on numerous occasions the recommended site and flight paths are to be just 1.5 kilometres away.

With such close flight paths and underlined by trial flights one will be interrupted from conducting normal conversation, television and radio listening will be interrupted, sleep interrupted and normal thought processes interrupted.

While the proposed flight paths will have enormous negative impact on my personal lifestyle the aircraft shall be detrimental to an abundance of wildlife that exists within the Coconut Well lagoon and tidal creek area.
The westward flight path also passes over the initial rise of Buckley's Plain, one of Broome's most scenic places. This site has such magnificent views of Broome and the beaches. It more than rivals the Gantheaume Point development site.

Further evidence of sub-standard efforts revealed by BART was at the public meeting held on March 3rd 1999, BART officials admitted that aircraft in trial flights did not fly accurately on some proposed flight paths.
- Multi million dollar aircraft with such sophisticated navigational equipment could not lock onto coordinates and fly correctly on proposed flight paths??
Where will aircraft actually be flying? Will they be even closer to my place of residence?

During previous meetings officials emphasised that international flight take-offs (the big potential growth area) would veer north and fly approximately parallel to the Cape Leveque Road. Without any further consultation it was announced at the March 3rd meeting that the recommended international flight take-off path would continue in a westward direction and fly close to existing residences.

At this point I also question what guarantees the public will have as in regard to flight paths.
No matter where the airport site might end up can planes/pilots be forced to fly on recommended flight paths?
Would there be a policing body that can enforce flight path adherence?
Would such a policing body have the bite to prosecute offending planes/pilots?

I am well aware of the different parties that have to be appeased in this relocation process but the present bottom line is that the recommended site and consequent flight paths will have great negative impact on myself and southern Coconut Well properties.

The recommended site and consequent flight paths do not take into account the fragile and unique elevated nature of the Coconut Well subdivision.
The recommended site and consequent flight paths are far too close to the southern end of the Coconut Well subdivision!!

Ed Carroll
Coconut Well resident

PO Box 1572
Broome WA 6725

13-03-99

Dear Mr Carroll

Broome Airport Relocation

Thank you for your circular letter of 13 March 1999 (which you also sent to a number of other persons) relative to the proposal to relocate the Broome Airport to a site approximately 12 kilometres north east of Broome. I note the distance from the present airport to the southern end of Coconut Wells is about the same as the distance from the new airport site.

I understand you were present at the public meeting held in Broome on the evening of 3 March 1999 and hence would be aware of the need to relocate the airport as it is inhibiting the planned growth of Broome.

I am also informed that at the public meeting you raised substantially the same points covered in your letter. As explained to you then, there has been substantial consultation throughout the process with the parties likely to be impacted by the new airport. As you would appreciate, the consultation process had been more intense with communities within close proximity to the airport site as it was felt that they were more likely to be impacted by aircraft operations than those communities more distant from the site. Notwithstanding, the Coconut Wells community was consulted during the process through Mr Charles Hegerty (the President of the Coconut Wells Residents and Ratepayers Association).

At the public meeting, it was explained that the BAe.146 aircraft which flew the demonstration flight into the new site on 31 October 1998 had in fact taken off from the existing airport and was required to fly a large arc to join the track into the new airport. Because of this, the aircraft joined the "international track" at a point a little further to the north west than would normally be the case for a flight to or from an overseas destination. In the case of a true international flight, the flightpath taken would follow the track as shown on the map which was supplied to you.

It is interesting to note that no major noise or operational concerns have been raised by communities in close proximity to the new airport site, even though all aircraft tracks (general aviation, domestic and international) traverse their properties and at a much lower altitude than is the case at Coconut Wells. The only flightpath in the vicinity of Coconut Wells is the international one and that track is approximately 2 kilometres south of the southern most block at Coconut Wells and aircraft would be at a height of some 4,000 feet, on climb out, at that point.

Another point to consider is that Chapter Two noise rated aircraft (such as the Fokker F.28) will be banned from flying in Australia well before the new airport is built. In fact, aircraft regulators are now working towards Chapter Four noise standards. It is also worth noting that the Chapter Three rated BAe.146 (the most common jet airliner serving Broome and the aircraft used in the demonstration) is recognised as an exceptionally quiet aircraft and is the only jet permitted to operate into London's city airport in the Docklands area and to operate during the curfew hours into Sydney Airport.

As you would be aware, while efforts are being made to encourage international operations into Broome, this will always only be a small percentage of the total aircraft movements through the airport, with a daily international service being a longer term goal.

You raised the point in your letter as to whether pilots can be forced to fly particular tracks into and out of the new airport. I am informed that the airport owners propose to have an air traffic management arrangement in place at the new airport and, in these circumstances, the tracks flown by pilots will be as directed by the air traffic controller in accordance with laid down procedures.

I acknowledge that the new airport site may not always satisfy all residents, but it is essential to meet the needs of the vast majority, the local community and the travelling public, and to meet stringent environmental, heritage and technical requirements. For these reasons, the site selection process has been a most exhaustive process with a number of sites (some much closer to Coconut Wells) being excluded from further consideration.

I have no doubt that the site selected has undergone a thorough evaluation process and is the most suitable site than can be found within a reasonable distance of Broome. Notwithstanding, the selected site will be required to undergo an environmental impact assessment.

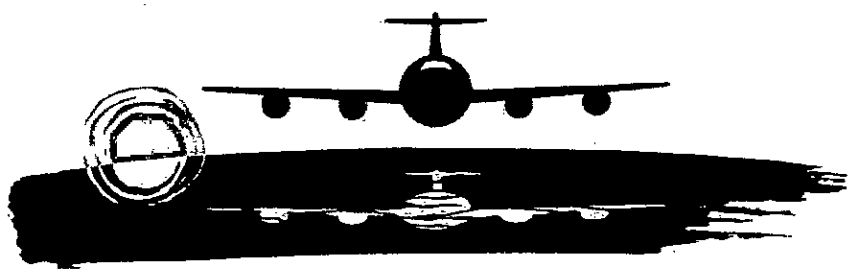
If you are still dissatisfied with potential noise impacts on your property, you will have the opportunity to raise these concerns during a later consultation process.

Thank you again for your letter.

Yours sincerely

Murray Criddle, MLC
MINISTER FOR TRANSPORT

Broome International Airport Holdings



Flight and Noise Forecasting 1999 - 2025

Professor Stephen Emery
December 1999
Kubu Australia Pty Ltd

KUBU

Broome International Airport Holdings

Relocation of Broome International Airport

Flight and Noise Forecasting 1999-2025

December 1999
Professor Stephen Emery
Kubu Australia Pty Ltd, Perth

EXECUTIVE SUMMARY

These forecasts have been prepared as part of the planning process for the relocation of Broome International Airport. They are also an input to the Public Environmental Review being prepared by Halpern Glick Maunsell, and as an input to the Airport Master Plan.

Traffic (passengers and flights) forecasts

This report contains forecasts of passengers and flights (aircraft movements), every year to 2010, with additional forecasts at 2015 and 2025. These have been prepared by statistical projection using historical traffic at Broome Airport, together with other factors that would influence future demand. Future traffic from direct international flights has been estimated and added to the forecasts. Transit passengers are not included in the passenger forecasts, but allowance has been made for them in the forecast aircraft movements.

The airline traffic mix in 1999 was predominantly 70 passenger (BAe146 size) aircraft, with some smaller regional turboprop aircraft. This is forecast to move to a mix of 130 passenger aircraft (Boeing 737-300, -400, -700 size) and 100 passenger aircraft (A318 size), together with some smaller turboprop aircraft. There will be some occasional large aircraft (767 size). The international direct flights have been forecast to be by 130 passenger size aircraft (Boeing 737, Airbus A319/320).

The forecast passenger and aircraft movements at Broome International Airport are shown in the tables below.

Year	Passengers (total)	Domestic	International
1999	178,064	178,064	-
2010	430,298	369,146	61,152
2015	513,697	452,545	61,152
2025	742,898	655,538	87,360

Year	Airline movements	Total aircraft movements
1999	5,122	13,492
2010	8,006	20,626
2015	9,014	24,234
2025	12,023	34,343

Aircraft noise

The major offsite impact associated with the relocation of Broome International Airport involves noise related to aircraft operations. To determine noise impacts, ANEF for the years 2010 and 2025 have been prepared for the new airport. An analysis of these, made in conjunction with the Australian Standards on aircraft noise, showed that the noise impacts are nil to negligible.

CONTENTS

1 INTRODUCTION

Broome International Airport serves the Broome township, Broome Shire and surrounding area in the Kimberley. The airport is being relocated to a new site at some 12 km east of the Broome townsite. As part of the relocation process, a Public Environmental Review (PER) and a Master Plan are being prepared. The preparation of both these documents require forecasts of passenger and aircraft movements to be available.

2 HISTORICAL AND FUTURE GROWTH

This section presents the results of a passenger study at Broome, historical traffic at Broome Airport, summarises the forecast methodology, and presents the growth scenarios for annual forecasts of passengers, cargo and aircraft movements used for planning purposes.

For the fiscal year ended 30 June 1997, 60 million passengers were handled at airports around Australia. Perth International Airport was the nation's fourth busiest then in terms of passengers, accounting for 4.6 million passengers. Broome International Airport was one of the largest regional airports in Western Australia, accounting for 170,448 passengers in the same year. The Broome International Airport traffic was only 168,174 for fiscal year ending June 1999, showing a levelling or even slight drop over the last two years. The reasons for the levelling of growth are discussed later in the report.

Broome International Airport serves the Broome town, Broome Shire and surrounding area in the Kimberley. Broome is the most important town in this remote area.

2.1 Passenger study

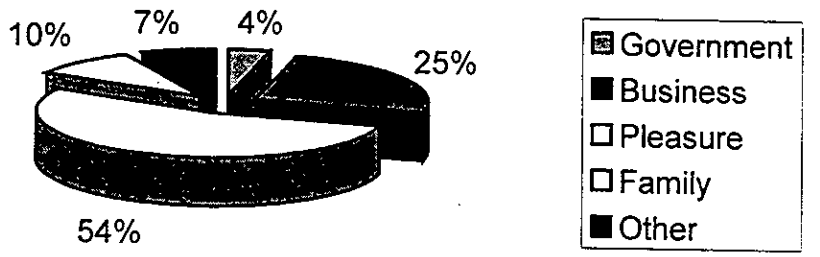
The origin/destination of passengers was determined by a passenger survey conducted in the period 23 to 29 March 1999. It covered all scheduled jet services to/from Broome[1]. This period is outside the peak tourist period of May to October, and the passenger survey gives the profile of off-peak Broome airport traffic. It is also outside holiday periods of both the Southern and Northern hemispheres. It is therefore considered to be a baseline study, to which the tourism peaks are usually added.

Of the passengers responding to the survey, 84% were non-Broome residents and 16% Broome residents. This 84/16 split is an unexpected imbalance in this off-peak period, and a split closer to 30/70 would have been expected. It indicates that off-peak Broome is generating much more traffic than expected from local residents and businesses alone.

[1] Buckey, R (1999) Broome International Airport Pax Survey graphs 23 March 1999 to 29 March 1999. BIAH, Perth

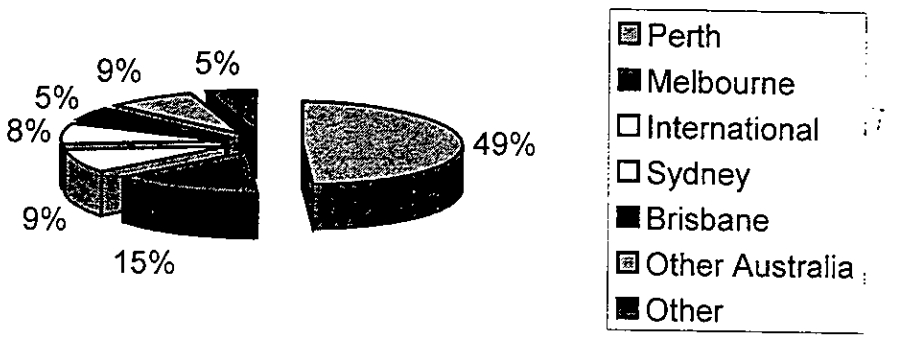
The primary reason for travel was pleasure (54%), followed by business (25%). This is a very high level of leisure air travel for this off-peak period. The source of passengers was primarily Perth (49%), followed by Melbourne (15%), and international (>9%). This is a high level of out-of-WA air passengers for an off-tourist peak period.

Broome - reasons for travel



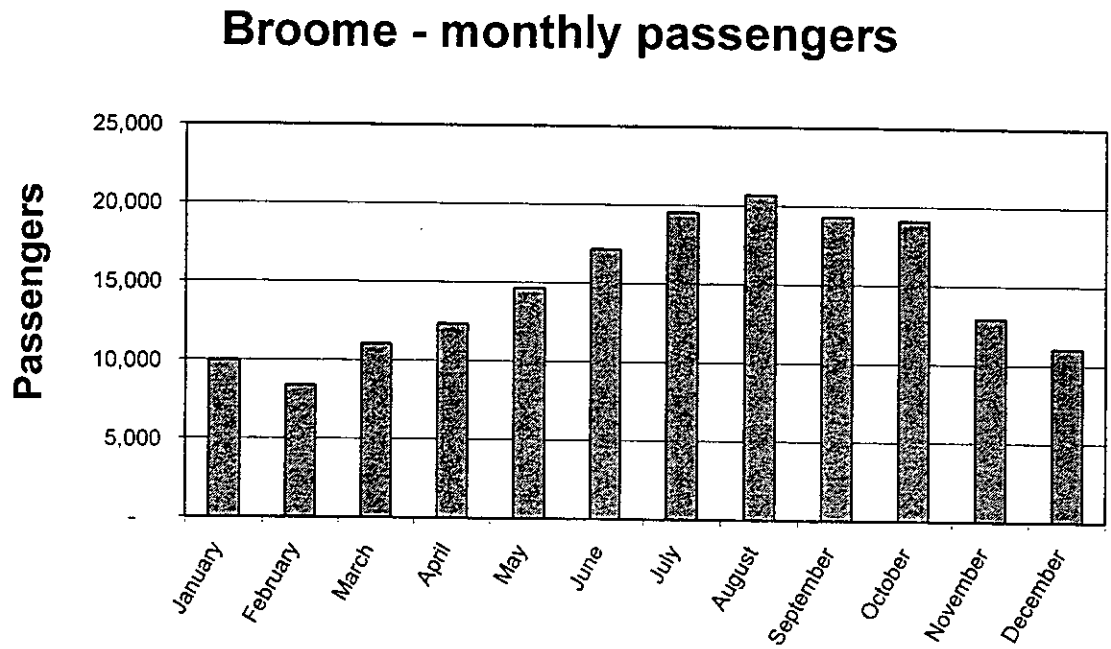
It should be noted that this survey was also conducted during a period without direct international flights to Broome. The direct flights to Bali, planned for 2000, are expected to change this pattern. The source of the international visitors in the survey was USA (3%), UK (3%), Germany (1%), Europe (1%), and Asia (1%).

Broome - passenger origin



The passenger survey indicates that there is a significant market in tourist traffic, even in the off-peak period. A significant component of the business traffic is considered to be directly associated with the tourism traffic of Broome. A preliminary split of the air traffic at Broome has therefore been made into two strands: the off-peak period: tourist associated strand (estimated at 70% of the traffic) and the local resident associated traffic (estimated at 30%).

The traffic split will change in the peak tourist period. As the following graph shows, the traffic almost doubles from the survey period in March to the peak month of August.



The traffic split into tourist and non-tourist traffic has therefore been adjusted to the estimated average for the whole year, as:

- 80% associated with tourism,
- 20% local resident associated traffic.

The passenger survey also showed a high level of repeat travel potential:

- 63% would recommend Broome for a holiday,
- only some 20% are not likely to travel to Broome again

2.2 Forecast Methodology

The methodology used in preparing the forecasts of traffic at Broome Airport combined historical analyses of statistical data, with other factors that would influence future demand.

Statistical regression was used to evaluate historical relationships at Broome for airline passenger growth. For purposes of evaluating future airline passenger demand generated by economic growth, the following forecasts were considered:

- Australian Gross Domestic product (GDP), prepared by the Commonwealth,
- Western Australian Gross State Product (GSP), prepared by the Western Australian government,

Other factors that will affect future traffic, but which were not adequately reflected in historical trends and economic data were also considered. These included:

- Continued liberalisation of international travel, especially the effects of negotiating international landing rights at regional airports on a case by case basis, which was introduced in 1999,
- Improved domestic air service to Broome with growing links to the Eastern States and Alice Springs,
- Introduction of 737/A318[2] aircraft to regional WA air service,
- Successful introduction of a third operator on Australia's trunk routes bringing increased competition in domestic flights (although the operator may not service Broome directly, this will still have the effect of bringing down the cost of indirect flights to Broome),
- International flights from Broome to Bali, and linkages to Singapore.

Factors that were not considered in the forecasts because of the difficulty of predicting their occurrence included:

- International fresh and perishable food linkages,
- International cargo hubbing at Broome.

2.3 Passenger forecasts

2.3.1 Assumptions

In preparing traffic forecasts, the following assumptions were made regarding key factors that would affect traffic at the airport:

- Australia's GDP would increase at an average of 2.5% per year through 2005, and 2.0% per year through 2007,
- WA's GSP would increase at an average of 4.0% per year through 2005, and 3.5% per year through 2007,
- The future response of domestic passenger demand to forecast economic growth will be greater than that experienced historically because of improved air services levels and accessibility to Perth and to Broome,
- The effect of the 1999 political instability in nearby Asian countries will be to divert some Income Group A/B, Australian-derived, traffic from Bali and Asia to Broome. This in turn will lead to increased domestic passenger tourist demand.
- The growth of international passenger demand, both coming to Broome through other Australian ports, and direct to Broome, will be greater than

[2] The introduction of Airbus narrow body aircraft would include one or more members of the family of A318/A319/A320 aircraft. These have typical passenger capacities of 107/124/150 respectively.

experienced historically at most Australian international airports because of increased exposure, and international route improvements.
- Broome would continue as a hub for other destinations in the Kimberley and Pilbara.
- Renewed activity in oil and gas exploration would occur off the Kimberley coast.

It was further assumed that the future growth in traffic at Broome International Airport during the forecast period would not be constrained for long by limitations in the airport, air transport systems, or government policies that restrict growth.

2.3.2 Traffic growth due to local residents

The traffic growth due to local residents can be substantially tied to the population growth rate. There will be some slight extra growth due to increased air travel/person following expected long term fare cuts, but the remote location of Broome has meant that air travel/person is already high.

The Australia Bureau Statistics (ABS) population figure quoted represents the Estimated Resident Population (ERP), i.e. people who normally reside within the local statistical area. The figures exclude temporary, seasonal and cyclical (fly-in fly-out) employees and tourists who represent the service population which place additional demands on the airport. The 1996 ABS figures are preliminary ERPs for both the Shire and Broome township, which includes the surrounding areas of Coconut Wells and 12 Mile.

The actual population count for the Shire and Broome on Census night, which includes both residents normally residing in the local statistical area plus non-residents, was 13,700 and 11,380 respectively. The Broome township figure recorded 4240 non-resident visitors.

From Ministry of Planning population growth estimates[3], the Broome township resident population data are shown in the table below. The annual growth rate assumed there was 3.25%, and it is reasonable to adopt the Ministry's growth rate throughout the forecast period.

Table : Broome township resident population

Year	Population
1997	9189
1998	9488
1999	9790

2.3.3 Traffic growth due to tourism

The tourism growth rate is somewhat independent of the resident population growth rate. It depends more on air fares, marketing, airline schedules, and tourist facilities in Broome, rather than resident population. The tourist growth

[3] Woodmore, FP (1997) Report and Valuation, Broome International Airport Land.

rate was estimated for Broome using historical traffic trends at the airport, and incorporating other tourist trends.

The historical growth of airline passengers at Broome over the last few years has been constrained by accommodation and, more recently, by access to aircraft seats. Even though that period has seen significant development of tourist and accommodation facilities and some improvement in airline access and fare competition, this was not nearly enough to allow tourist traffic to have normal growth without constraint. The accommodation constraints eased in 1996/7, but aircraft seat availability was constrained until July 1999, when an extra 600-700 seats per week were added. Passenger traffic had been essentially level over the last three years from 1996/97 to 1998/99. It jumped 15% (compared month to month with 1998) for the months from August 1999 to November 1999, after the extra seats became available.

Constraints to growth are expected to come and go in the forecast period, as airlines and Broome town development respond to demands[4]. These will make forecasts slightly less accurate in the short term, but the medium to long term trends should be unaffected.

2.3.4 Passenger forecasts

On the basis of the assumptions above, three alternative forecasts of passengers were prepared for the period 2000 to 2025. It should be noted that none of these forecasts included any numbers from international direct flights, which had to be estimated separately in a later sub-section. These are domestic passenger forecasts, and the three alternatives are:

Historical growth

This forecast was made on the basis of traffic over the 8 years of private ownership of the airport: from 1991 to 1999. The airport growth is considered to be relatively stagnant before then.

Passenger data for calendar year 1999 was estimated from actual figures up to November 1999, and then by estimating traffic for December. Estimating was done using previous year's traffic for December, extrapolated by the average year-to-year growth rate for August to November 1999.

The data were extrapolated statistically using regression analysis. Several forms of regression were tried, including linear, logarithmic, polynomial, exponential, and moving average. The best fit here was linear, with a correlation coefficient R^2 of 0.93. The forecast airline passengers are shown in the following table.

[4] This is usually called the chicken and the egg syndrome.

Table : Forecast airline passengers by historical growth method

Year	Growth rate	Domestic passengers
2000	10.3%	196,400
2001	9.4%	214,800
2002	8.6%	233,200
2003	7.9%	251,600
2004	7.3%	269,900
2005	6.8%	288,300
2006	6.4%	306,700
2007	6.0%	325,100
2008	5.6%	343,400
2009	5.4%	361,800
2010	5.1%	380,200
2015	4.8%	472,100
2025	3.9%	655,800

Australian economic growth

This forecast was made by consideration of economic growth rates and changes in domestic passenger demand and future international demand. This is the similar to the methodology used at Perth International Airport in their 1999 Master Plan[5]. This methodology will be applicable in Broome since almost half the Broome traffic comes from Perth. The forecast airline passengers are shown in the following table.

Table : Forecast airline passengers by Australian economic growth method

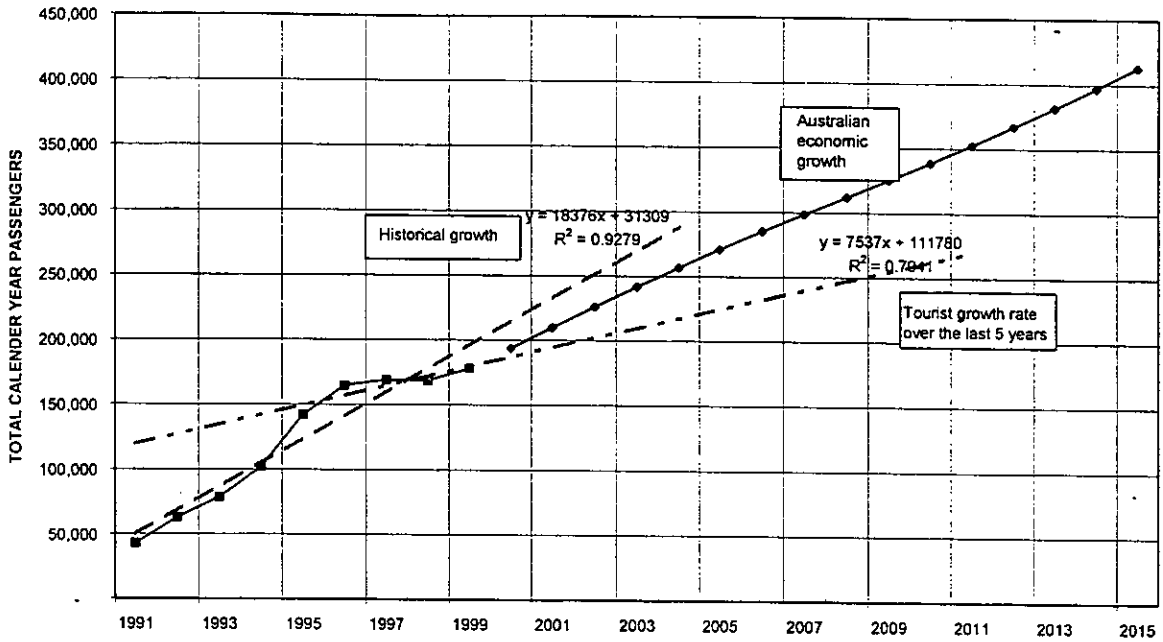
Year	Growth rate	Domestic passengers
2000	8.7%	193,600
2001	8.3%	209,600
2002	7.7%	225,800
2003	7.0%	241,600
2004	6.2%	256,500
2005	5.6%	270,900
2006	5.2%	285,000
2007	4.7%	298,400
2008	4.5%	311,800
2009	4.3%	325,200
2010	4.1%	338,600
2015	4.0%	412,700
2025	4.0%	610,900

Tourist growth dominating

The forecast assuming that tourist growth dominates Broome traffic growth was made difficult by the constraints in growth over the last few years

[5] Bechtel Australia (1999) Perth International Airport Master Plan and Environment Strategy. Vol. 1., Perth International Airport.

BROOME : OUTPUT OF FORECAST METHODS



(discussed in section 2.3.3). The traffic data over the period 1995 to 1999 where tourist traffic was believed to be dominating were extrapolated statistically using regression analysis. Several forms of regression were tried, including linear, logarithmic, polynomial, exponential, and moving average. The best fit here was linear, with a correlation coefficient R^2 of 0.79. This gave a growth rate of 4% which is considered too low. It does show the impact of the constraints, but is not suited to projection of future traffic now that the constraints have been lifted.

The traffic growth in each of the months after lifting constraints, August 1999 to November 1999, averaged 15% compared to the same month in the previous year. This is not seen as a sustainable medium or long term growth rate as it partly represents a release of pent-up demand, together with the diversion of some Income Group A/B, Australian-derived, traffic from Bali and Asia to Broome due to the 1999 political instability in nearby Asian countries.

However a medium-term growth rate somewhere between the 4% and 15% is expected, and for the forecast this was taken as an approximate average of the two rates, 9%, for the first five years. Thereafter the growth rate was assumed to be less, although still above the population and economic growth rates (which were then in the range 3 to 5%), and a growth rate of 6% was taken for the next five years. In the long term, after 2010, the tourist growth rate was taken to be the same as the economic growth rate of 4%. The forecast airline passengers are shown in the following table. The plot of the outputs of the three forecast methods is shown in the graph above.

Table : Forecast airline passengers by tourist growth dominating method

Year	Growth rate	Domestic passengers
2000	9.0%	194,090
2001	9.0%	211,558
2002	9.0%	230,598
2003	9.0%	251,352
2004	9.0%	273,974
2005	6.0%	290,412
2006	6.0%	307,837
2007	6.0%	326,307
2008	6.0%	345,885
2009	6.0%	366,639
2010	6.0%	388,637
2015	4.0%	472,836
2025	4.0%	699,913

International direct flight traffic

The forecast of international direct flight passengers could not be made from historical data because almost none exists. There were international flights in the period October 1995 to February 1997, but these were mainly positioning flights for Christmas Island, were without proper marketing. The forecast was made by constructing traffic growth from first principles[6]. The forecast international direct flight traffic was limited to approximately 15% of the total traffic, to give a reasonable linkage to growth in domestic traffic.

The forecast was made starting with the proposed direct Bali flights in 2000. This is planned to use a BAe146 initially, with a single aircraft per week, operating 8 months of the year. This was forecast to quickly grow as shown in the following table. Daily flights were forecast in 2004, by virtue of the expected success from the Broome-Bali-Singapore linkage.

Table : Forecast international direct flight passengers

Year	International passengers	Notes
2000	2,912	1 plane/week, Bae146, 70% load factor, 8 months
2001	12,480	2 plane/week, 737, 50% load factor, 12 months
2002	17,472	2 plane/week, 737, 70% load factor, 12 months
2003	26,208	3 plane/week, 737, 70% load factor, 12 months
2004	37,440	5 plane/week, 737, 60% load factor, 12 months
2005	43,680	5 plane/week, 737, 70% load factor, 12 months
2006	52,416	Daily flight, 737, 60% load factor, 12 months
2007	52,416	Daily flight, 737, 60% load factor, 12 months
2008	56,784	Daily flight, 737, 65% load factor, 12 months

[6] Substantially based on discussions with Mr Ron Buckey, General Manger of Broome International Airport Holdings, who is a noted aviation and tourist expert.

2009	61,152 Daily flight, 737, 70% load factor, 12 months
2015	61,152 Daily flight, 737, 70% load factor, 12 months
2025	87,360 10 flights/week, 737, 70% load factor, 12 months

Adopted forecast airline passengers

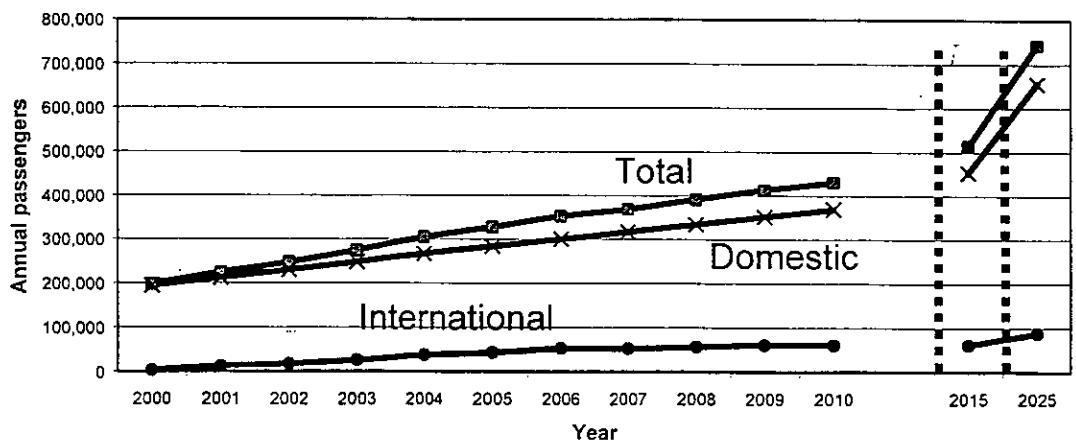
The adopted forecast was made using the average of the three domestic forecasts for 2000 to 2025, and adding to that the international direct flight passengers. The adopted forecast airline passengers are shown in the following table.

Table : Broome adopted forecast : airline passengers

Year	Growth rate	Domestic passengers	Int'l pax	Total pax
2000	11.0%	194,697	2,912	197,609
2001	13.6%	211,986	12,480	224,466
2002	10.2%	229,866	17,472	247,338
2003	10.9%	248,184	26,208	274,392
2004	10.9%	266,791	37,440	304,231
2005	7.4%	283,204	43,680	326,884
2006	7.8%	299,846	52,416	352,262
2007	4.8%	316,602	52,416	369,018
2008	5.8%	333,695	56,784	390,479
2009	5.6%	351,213	61,152	412,365
2010	4.3%	369,146	61,152	430,298
2015	3.9%	452,545	61,152	513,697
2025	4.5%	655,538	87,360	742,898

The adopted forecast is shown on the graph here.

Broome Airport - forecast of annual passengers



Impact of transit passengers on aircraft movements

The forecast passengers do not include transit passengers, who arrive at Broome on one flight, and tranship onto another flight to surrounding ports such as Kununnurra or Derby. These passengers are not counted as part of Broome passenger statistics, but they will affect the number of aircraft movements generated, since there are more actual passengers than forecast passengers. It is estimated that at present 30 passengers per day tranship. This was forecast to increase to 100 passengers per day by 2015[7]. Analysis showed that this is about 5% of forecast passengers, and so passenger numbers used in the calculation of aircraft movements were increased by 5% to cater for transhipment.

2.4 Air cargo

The historical uplift of air cargo from Broome Airport has been negligible, and limited to newspapers, mail, and a limited number of packages. The development of a volume air cargo market would be driven by the industrial and agricultural base of Broome, both of which are limited and are expected to remain so. Over the forecast period, it has been assumed that the air cargo market will remain insignificant, and capable of being satisfied by normal hold space on scheduled flights. No specific forecast has been made for air cargo.

2.5 Aircraft movement forecasts

Aircraft movement forecasts were made for the various aircraft types using Broome: airline aircraft (including secondary carriers using turbine equipment), Coastwatch, and general aviation forecasts. Carriers using piston-engined aircraft for airline use are included in the general aviation forecasts. Forecasts were made from airline schedules, aircraft types, and from first principles.

2.5.1 Airline aircraft schedules

The airline schedules vary with demand and thus season. The summer 1999 (off-season) schedules[8] are shown in the following table.

Table : Broome summer 1999 schedules

PORT	RETURN SERVICES PER WEEK			
	Ansett/associates		Qantas/Airlink	
Alice Springs	1	BAe146	2	BAe146
Bali	0			
Darwin	5	BAe146/F28	3	BAe146
Derby	6	Metro		
Kununurra	2	BAe146/F28		
	4	Brasilia		
Perth	19	BAe146/F28	6	BAe146

[7] Mr Ron Buckey, op.cit.
[8] Source: Ansett and Qantas schedules, 1999

Re-arranging this by aircraft type, and noting that a return service generates 2 movements at Broome, gives the following table of movements for 1999:

Table : Broome 1999 airline aircraft movements

AIRCRAFT	MOVEMENTS	
	Weekly	Annual
BAe146	76	3952
Metro	12	624
Brasilia	8	416

Note: this does not include allowance for seasonal change or peak periods

2.5.2 Forecast airline aircraft types

The airline aircraft movements forecast depends on the aircraft types in use. The list of aircraft types has been based on the known and expected changes in types of aircraft in airline service, which are shown in the table below. Key changes are:

- phasing out of F28 aircraft in December 1999,
- replacement of BAe146 aircraft over the next few years. This is likely to be by medium capacity jets of the A318/A319/A320 class or Boeing 737 aircraft. The phasing out of the BAe146 aircraft could also bring Challenger CRJ[9] aircraft to elsewhere in WA, although this may not impact on Broome.

Table : Forecast aircraft types in service at Broome

Aircraft size and type	Current	Future
Large capacity jet (200-250 pax)	767	767
Medium capacity jet (100 - 150 pax)	737-300	A318, A319, A320, A321, 737-400, 737-300
Small capacity jet (70 pax)	BAe146-200, BAe146-100, F28	BAe146-200, BAe146-100, Challenger CRJ
Medium capacity turboprop (30 pax)	Brasilia	Brasilia, SAAB 340
Small capacity turboprop (18 pax)	Metroliner	Metroliner

2.5.3 Forecast of airline aircraft movements

The forecast of future airline aircraft movements has been made by a combination of extrapolating present airline movements, and first principles taking into account changes in aircraft type. This forecast was governed by certain assumptions. These are:

[9] Available in 50 and 70 seat nominal capacity

- the Average Annual Load Factor (AALF) would remain in the range 59%-63% until after 2015 when it would grow in a more mature market (for 1999, AALF was 59%)[10],
- traffic planning will continue to be aimed at frequency, which will favour small/medium aircraft rather than larger aircraft,
- airline services at Broome will be governed by the type of airline services provided elsewhere in WA, and, to an extent, by aircraft used on trunk routes in Australia,
- turboprop aircraft movements are assumed to grow at 4% per annum, since they are related more to resident travel and thus local population growth, than tourists,
- transit passengers are included, as discussed above.

2.5.4 Coastwatch aircraft

There is a Coastwatch contractor base at Broome Airport in 1999 that generates significant aircraft movements. The future of this base will depend on future contractors for the service, but in this forecast, it has been assumed that Broome will continue to house a Coastwatch base. The most likely forecast of future Coastwatch traffic is that the present traffic levels will continue unchanged. The 1999 traffic is shown in the table below[11] and it should be noted that the <5,700 kg Coastwatch aircraft are included in the general aviation forecasts.

Table : 1999 Coastwatch aircraft movements

AIRCRAFT	MOVEMENTS		
	Weekly	Annual	Day/night
DHC 8	10	520	50/50
< 5700kg aircraft	12.5	660	90/10

2.5.5 General aviation aircraft

The general aviation (GA) aircraft movements have been forecast in terms of twin engine piston and single engine piston. There will be isolated movements of other GA aircraft, but these are too few to include specifically in the forecast. The usage of GA aircraft is linked to both the residential population of Broome and to tourism. The movements are forecast to grow at an annual rate of 4%, which is in line with the population increase.

Table : Forecast general aviation aircraft movements

Aircraft movements	1999	2010	2015	2025
GA single piston	3900	6000	7300	10800
GA twin piston	3950	6100	7400	11000

[10] This AALF is not the same as the load factor calculated by airlines, which typically runs at 70%. AALF assumes a constant frequency through the year and does not allow for the fine-tuning of capacity as practised by airlines.

[11] Source: Broome International Airport Holdings

Note: a movement is either a take-off or a landing

2.5.6 Forecast total aircraft movements

Forecast total aircraft movements were found from the forecast movements of airline aircraft, Coastwatch aircraft, and general aviation aircraft. The Coastwatch aircraft less than 5,700kg weight have been included in the general aviation total.

Table : Forecast total aircraft movements

TYPE	1999	2010	2015	2025
Airline	5,122	8,006	9,014	12,023
Coastwatch DHC8	520	520	520	520
General Aviation	7,850	12,100	14,700	21,800
Total	13,492	20,626	24,234	34,343

The airline aircraft forecast is detailed in the following table.

Broome Airport : Forecast airline aircraft movements

YEAR	B767 220 pax	B737 130 pax	A318 100 pax	Bae146 70 pax	Brasilia 30 pax	Metro 18 pax	Maximum capacity	Pax including transit, inter-national, domestic	AALF	Total airline aircraft movements
1999		130	-	3,952	416	624	317,252	186,967	59%	5,122
2000	20	260	-	4,160	430	650	354,000	207,343	59%	5,520
2001	20	520		4,160	450	680	388,940	235,065	60%	5,830
2002	30	728	1,095	2,773	470	710	431,753	258,831	60%	5,806
2003	52	1,092	1,825	1,387	490	740	460,987	286,801	62%	5,586
2004	52	1,092	2,555	1,387	510	770	535,127	317,571	59%	6,366
2005	104	1,456	2,555	1,387	530	800	595,027	341,044	57%	6,832
2006	104	1,456	2,555	1,387	550	830	596,167	367,254	62%	6,882
2007	104	1,820	3,650	-	570	860	657,060	384,848	59%	7,004
2008	104	1,820	3,650	-	590	890	658,200	407,164	62%	7,054
2009	104	2,184	3,650	-	610	930	706,840	429,926	61%	7,478
2010	208	2,548	3,650	-	630	970	778,360	448,755	58%	8,006
2015	416	2,548	4,380	-	660	1,010	898,740	536,325	60%	9,014
2025	832	3,931	5,256	-	792	1,212	1,265,246	775,675	61%	12,023

Note: (1) a movement is either a take-off or landing
(2) Fokker F28 are expected to be withdrawn from service at December 1999
(3) Boeing 737 is the average of 737-300 at 120 pax, and 737-400 at 140 pax
(4) This includes both domestic and international airline aircraft

2.5.7 Forecast aircraft movements day/night split

The forecast split of movements between day and night is needed for aircraft noise forecasts, although it should be noted that Broome Airport has predominantly day operations.

The present split of movements has been estimated from 1999 airline schedules and, for general aviation, from traffic data collated by Broome International Airport Holdings. This has been forecast by assuming a similar split of movements.

Table : Forecast aircraft movements day/night split

Aircraft size and type	Day/night split 1999	Day/night split Future
Boeing 767	100% / 0%	100% / 0%
Boeing 737	100% / 0%	70% / 30%
BAe146/A318	70% / 30%	70% / 30%
Brasilia	50% / 50%	50% / 50%
Metroliner	50% / 50%	50% / 50%
DHC8	50% / 50%	50% / 50%
General Aviation	90% / 10%	90% / 10%

3 NOISE

3.1 Introduction

The issues to be considered include forecasts of the noise exposure levels and the plans for managing development in areas that are affected by noise. This covers:

- Forecasts of the noise exposure levels and the plans for managing development in areas forecast to be subject to exposure above the significant Australian Noise Exposure Forecast (ANEF) levels. Significant aircraft noise is defined in the Standard as being a noise above 30 ANEF levels.
- Regard for the Australia Standard AS2021-1994 Acoustics Aircraft Noise Intrusion – Building Siting and Construction.
- Assessment of environmental issues that may be expected with the development of the airport and the plans for ameliorating or preventing environmental impacts.

3.2 Aircraft Noise Indicators

In Australia, three types of aircraft noise exposure indicators have been used:

- Australia Noise Exposure Forecast (ANEF) which indicates the anticipated noise contours for the most likely or preferred development and forecast. The ANEF considers more than peak sound levels and cannot be directly measured, but is more a measure of the overall noise impact. This is the most commonly used indicator, and is used in Australian Standard 2021.
- Australia Noise Exposure Concept (ANEC) which is a planning tool and is noise exposure resulting from proposed changes to the airport operations
- Australian Noise Exposure Forecast (ANEI) which calculates the actual noise exposure for some previous time period, generally a year.

The Australia Noise Exposure Forecast (ANEF) was used as the indicator of noise exposure at Broome. An issue to be aware of is that there can be misunderstanding when interpreting a set of ANEF contours. Aircraft noise does not cease at the edge of a noise contour; it is just less than that amount that the contour represents. Anywhere within a 20 to 30 km radius of the airport can expect, on occasions, to be overflown by aircraft and thus subject to aircraft noise. The majority of aircraft follow regular flight patterns but for a variety of reasons aircraft can be diverted from their usual path. They can overfly areas well removed from the indicated flight paths.

3.3 Broome Airport development strategy

The noise level forecast is to be overlaid on the proposed runway layout for the new Broome International Airport in order to assess the areas affected by aircraft noise. The development strategy for the new Broome International Airport provides for:

- Single runway layout, aligned 11/29 (runway magnetic bearing 110 degrees)
- Usability 98%
- Runway length 2700 metres x width 45 metres, with provision for eventual extension to 3,500 metres
- Parallel taxiway, aprons, and GA parking area
- Future short parallel runway for general aviation aircraft.

The single runway will take both departing and arriving aircraft, and operations in either direction are possible depending on wind direction and strength.

By 2025, the total number of annual aircraft movements of all aircraft at the new airport is forecast to be some 35,000. The practical annual capacity of the proposed runway layout is up to 180,000 movements[12], which is in excess of demand. The development strategy is therefore considered robust.

3.4 Aircraft noise modelling

Predictions of aircraft noise are based on outputs from the FAA Integrated Noise Model (INM). This computer programme produces various measures of noise, and has been modified[13] to suit the methodology for producing the Australian noise exposure indicators.

Assumptions

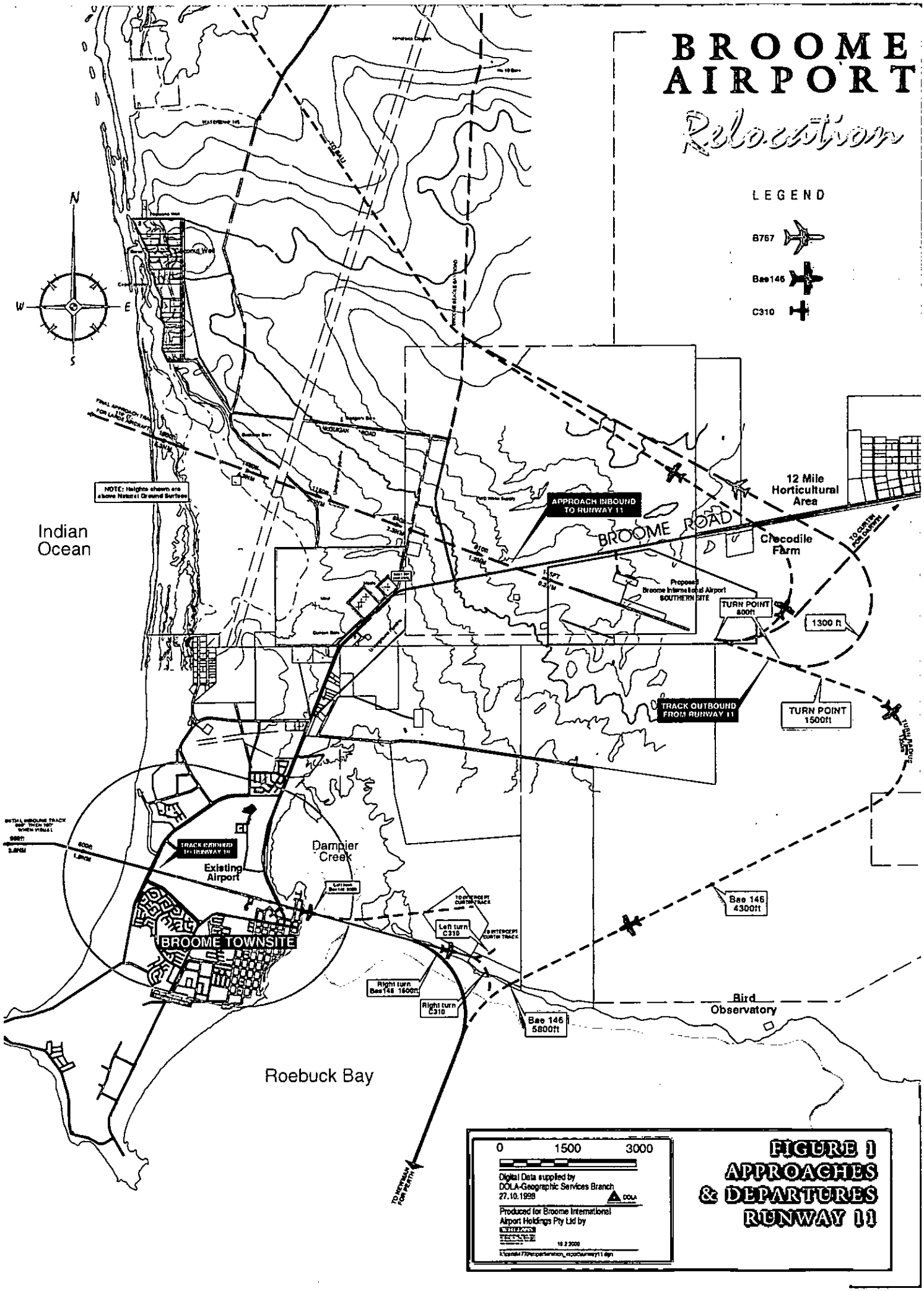
- Arrivals and Departures comprised 50% each of the traffic
- Runway Length is 2700 metres
- Runway 29 movements comprise 60% of the traffic
- Runway 11 movements comprise 40% of the traffic
- Turn Radius for Jet aircraft is 7.4 km (approx. 4.5 nm)
- Turn Radius for Turboprop aircraft is 5 km (approx. 3.0 nm)
- Turn Radius for GA aircraft is 1 km (approx. 0.6 nm)

Methodology

The data were entered into an Excel Spreadsheet with formulas connecting all columns except for the 'Annual' column, where Annual Movements were entered. The aircraft movement data for 1999, 2015 and 2025 are shown in the following tables.

The Runways and Flight Tracks were created in INM. See Figures 1 and 2 for the approaches and departures for each runway end. The traffic was then apportioned by Runway, Track and Profile. The INM Flight Timetables were created for the years 1999, 2010 and 2025. This enabled the aircraft movement volumes to be drawn for these years. Figures 3, 4 and 5 show these for the 29 departure.

[12] Federal Aviation Administration (1969) Airport Capacity used in Long Range Planning. Advisory Circular AC-150/5060-3A.
[13] Airplan, Melbourne


BROOME AIRPORT
Relocation
LEGEND
B767
Bae146
C310
N
W
E
S
NOTE: Heights shown are above Natural Ground Surface
Indian Ocean
APPROACH INBOUND TO RUNWAY 11
BROOME ROAD
12 Mile Horticultural Area
Crocodile Farm
Proposed Broome International Airport SOUTHERN SITE
TURN POINT 800ft
1300 ft
TRACK OUTBOUND FROM RUNWAY 11
TURN POINT 1500ft
Bae 146 4300ft
Existing Airport
Dampier Creek
BROOME TOWNSITE
Left turn C310
Right turn Bae146 1600ft
Right turn C310
Bae 146 5800ft
Bird Observatory
Roebuck Bay
0
1500
3000
Digital Data supplied by DOLA-Geographic Services Branch 27.10.1999
Produced for Broome International Airport Holdings Pty Ltd by
FIGURE 1
APPROACHES & DEPARTURES RUNWAY 11

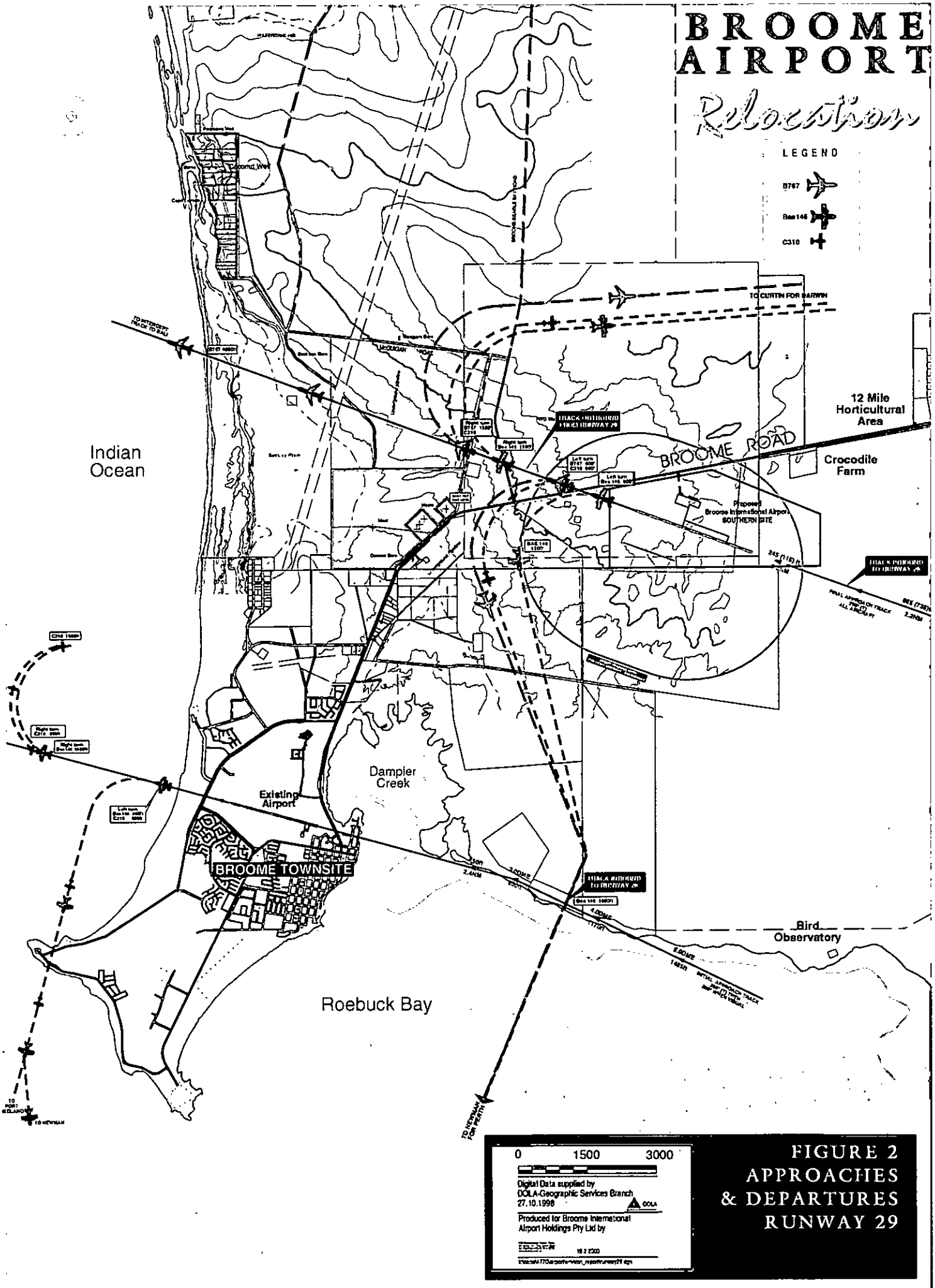
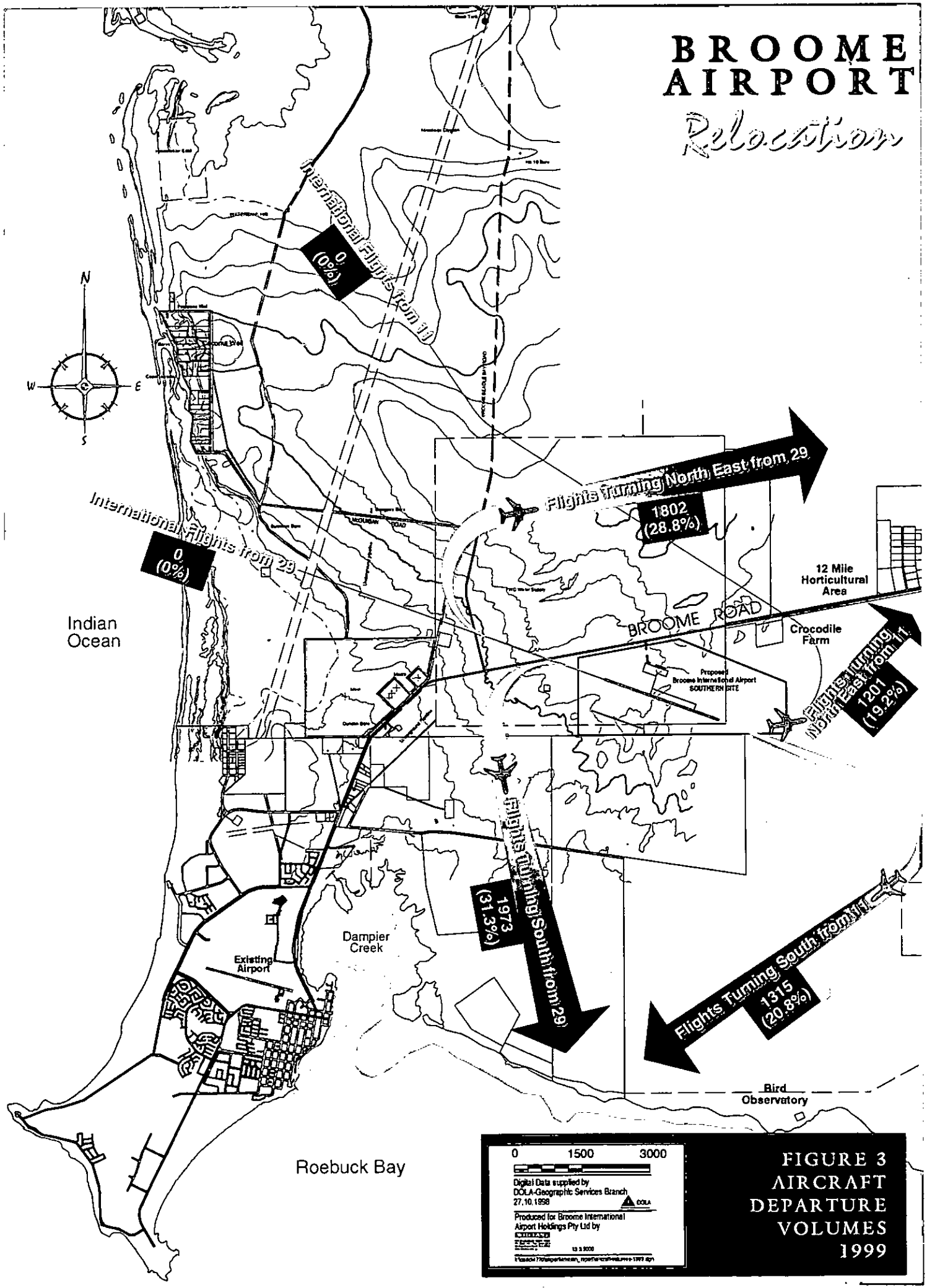
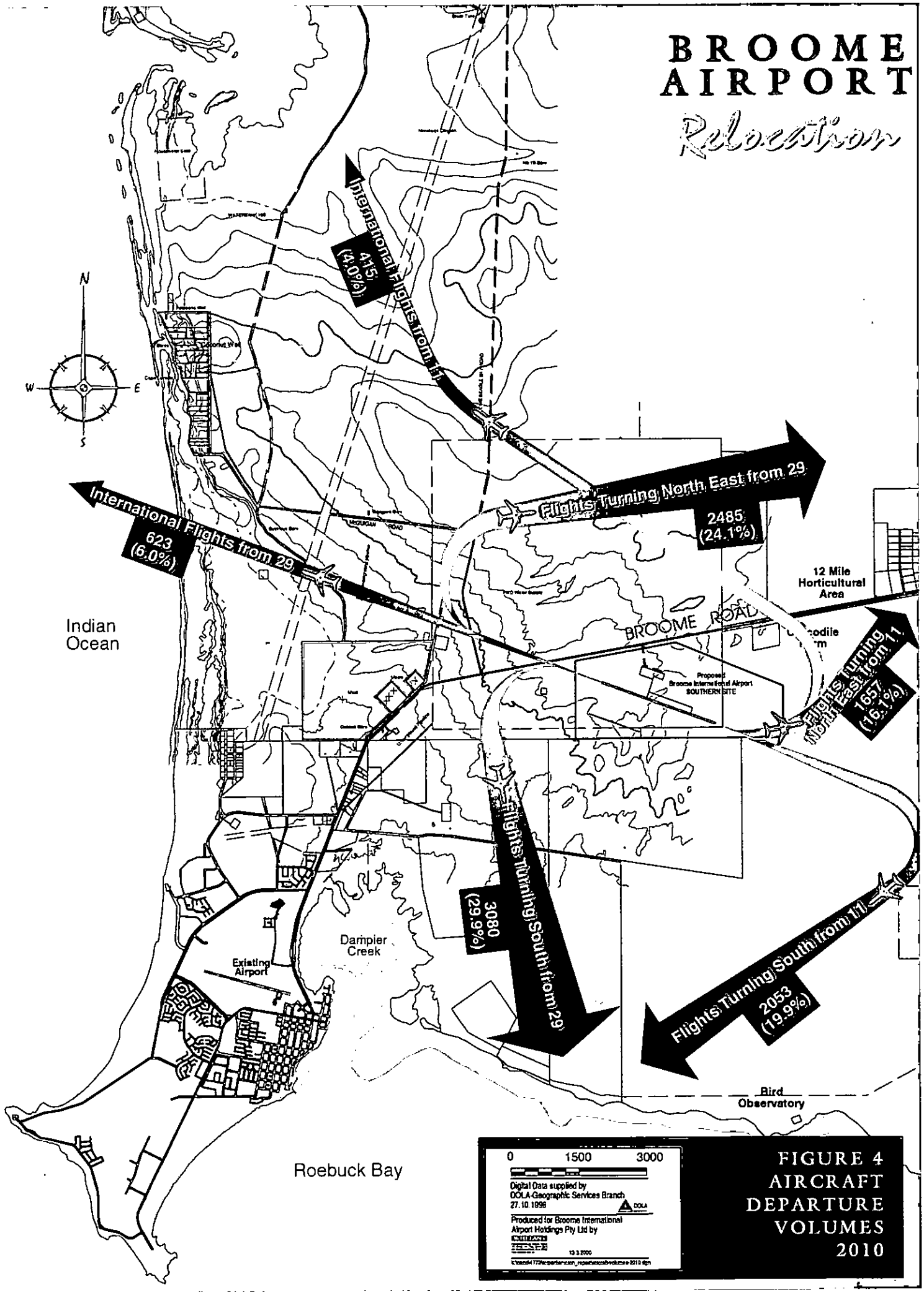


FIGURE 2
APPROACHES
& DEPARTURES
RUNWAY 29


BROOME AIRPORT
Relocation
International Flights from 11
0 (0%)
International Flights from 29
0 (0%)
Flights Turning North East from 29
1802 (28.8%)
Flights Turning North East from 11
1201 (19.2%)
Flights Turning South from 29
1973 (31.3%)
Flights Turning South from 11
1315 (20.8%)
N
W
E
S
Indian Ocean
BROOME ROAD
12 Mile Horticultural Area
Crocodile Farm
Proposed Broome International Airport SOUTHERN SITE
Dampier Creek
Existing Airport
Bird Observatory
Roebuck Bay
0
1500
3000
Digital Data supplied by DOLA-Geographic Services Branch 27.10.1998
Produced for Broome International Airport Holdings Pty Ltd by
FIGURE 3
AIRCRAFT DEPARTURE VOLUMES 1999


BROOME AIRPORT Relocation
International Flights from 11
415 (4.0%)
International Flights from 29
623 (6.0%)
Flights Turning North East from 29
2485 (24.1%)
Flights Turning North East from 11
1657 (16.1%)
Flights Turning South from 29
3080 (29.9%)
Flights Turning South from 11
2053 (19.9%)
N
W
E
S
Indian Ocean
BROOME ROAD
12 Mile Horticultural Area
Proposed Broome International Airport SOUTHERN SITE
Dampier Creek
Existing Airport
Bird Observatory
Roebuck Bay
0 1500 3000
Digital Data supplied by DOLA-Geographic Services Branch 27.10.1998
DOLA
Produced for Broome International Airport Holdings Pty Ltd by
FIGURE 4
AIRCRAFT DEPARTURE VOLUMES 2010

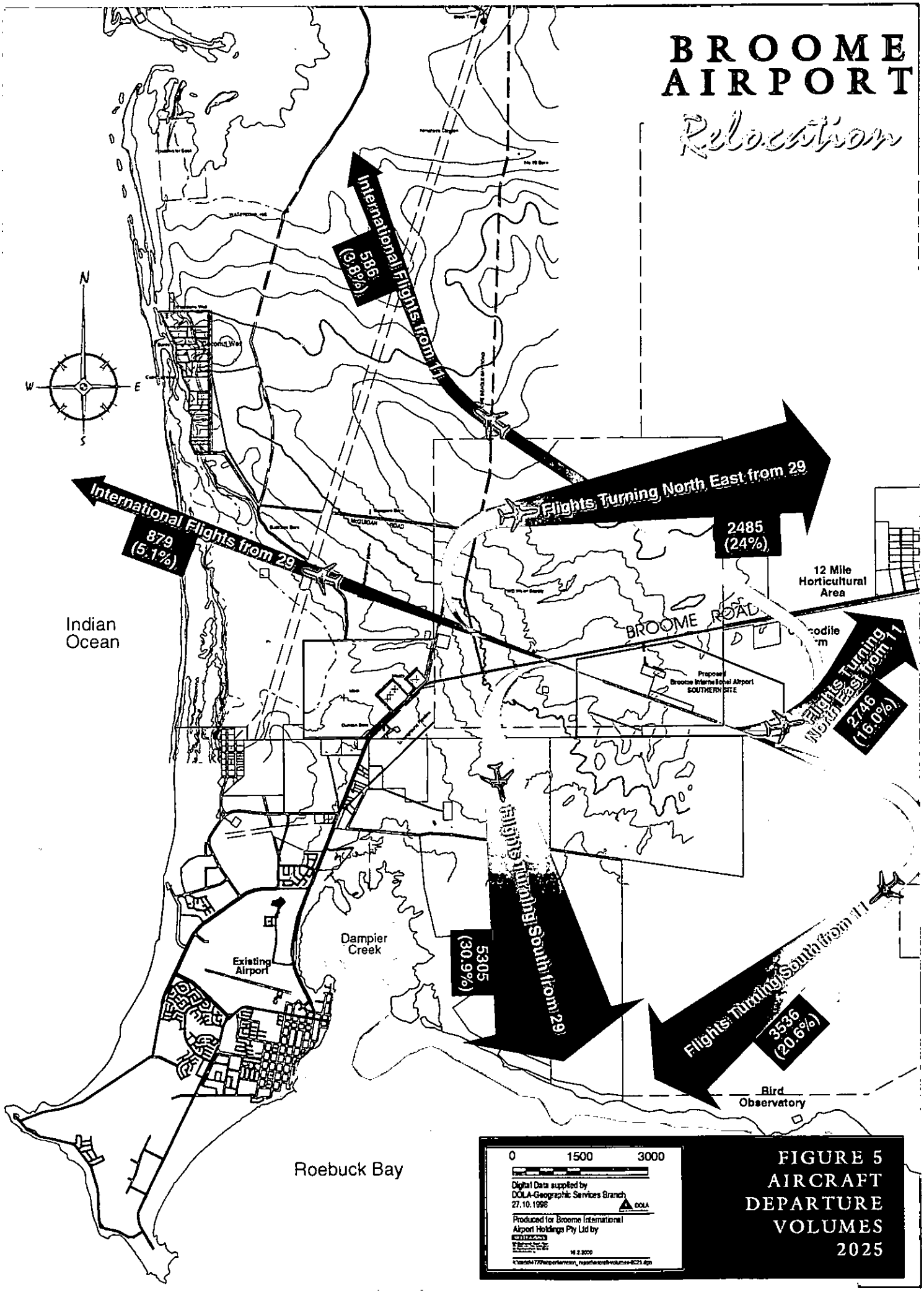


FIGURE 5
AIRCRAFT DEPARTURE VOLUMES 2025

Noise contours using the Integrated Noise Model Version 5.2 with the ANEF metric were generated and plotted.

Table Aircraft Movements for 1999

Aircraft Typ	INM Type	Annu %	Annual Mvmnt	Daily Mvmnt	Day Mvmnt s	Night Mvmnt	Day %	Nigh %
B767-300	767300						100	
B737-300	737300	0.96	130	0.36	0.36		100	
A318	A320						100	
BAe146-200	BAe146	29.29	3,952	10.83	7.58	3.25	70%	30%
DCH830	DHC8	3.85	520	1.42	0.71	0.71	50%	50%
Brasilia	SF340	3.08	416	1.14	1.14		100	
Metro	DHC6	4.62	624	1.71	1.71		100	
GA Single	GASEPF	28.91	3,900	10.68	9.62	1.07	90%	10%
GA Twin	BEC58P	29.28	3,950	10.82	9.74	1.08	90%	10%
Total		100%	13,492	36.96	30.85	6.11		

Table Aircraft Movements for 2010

Aircraft Type	INM Type	Annua %	Annual Mvmnt	Daily Mvmnt	Day Mvmnt s	Night Mvmnt	Day %	Nigh %
B767-300	767300	1.01%	208	0.57			100	
B737-300	737300	12.35	2,548	6.98	4.89	2.09	70%	30%
A318	A320	17.70	3,650	10.00	7.00	3.00	70%	30%
BAe146-200	BAe146							
DCH830	DHC8	2.52%	520	1.42	0.71	0.71	50%	50%
Brasilia	SF340	3.05%	630	1.73	1.73		100	
Metro	DHC6	4.70%	970	2.66	2.66		100	
GA Single	GASEPF	29.10	6,000	16.44	14.79	1.64	90%	10%
GA Twin	BEC58P	29.60	6,100	16.71	15.04	1.67	90%	10%
Total		100%	20,626	56.51	47.39	9.12		

Table Aircraft Movements for 2025

Aircraft Type	INM Type	Annu %	Annual Mvmnt	Daily Mvmnt	Day Mvmnts	Night Mvmnt	Day %	Nigh %
B767-300	767300	2.4%	832	2.28	2.28		100	
B737-300	737300	11.4	3,931	10.77	7.54	3.33	70%	30%
A318	A320	15.3	5,256	14.40	10.08	4.32	70%	30%
BAe146-20	BAE146							
DCH830	DHC8	1.5%	520	1.42	0.71	0.71	50%	50%
Brasilia	SF340	2.3%	792	2.17	2.17		100	
Metro	DHC6	3.5%	1,212	3.32	3.32		100	
GA Single	GASEPF	31.4	10,800	29.59	26.63	2.96	90%	10%
GA Twin	BEC58P	32.0	11,000	30.14	27.12	3.01	90%	10%
Total		100%	34,343	94.09	79.85	14.24		

For the new Broome International Airport, the 1999 (present traffic) ANEF and the ANEF for the years 2010 and 2025 were determined to enable a comparison to be made between present and future noise levels. These are shown in Figures 6, 7 and 8.

The noise forecast is expected to be reasonably robust with respect to changing aircraft type. There have been significant improvements in noise control technology for the latest generation aircraft, and new aircraft must conform to stringent noise controls.

This means that all future replacement aircraft types of a given size (and thus engine capacity) are likely to have similar noise signatures compared to other aircraft of the same size. Thus replacement of one type of medium jet such as A320 by another type of medium jet such as a Boeing 737-800 is not likely to have an impact on forecast noise, assuming that the frequency of movements remains the same.

3.5 Impact of aircraft noise

The impact of aircraft noise was assessed with reference to Figures 6, 7 and 8. The noise affected areas are to the north west and south east of runway 11/29. These areas are mainly within the airport boundary. The ANEF 30 contour is within the airport boundary for all forecasts. The ANEF 20 contour is almost completely within the airport boundary for the 1999 forecast, and extends approximately 1,5 km beyond the airport boundary for the 2025 forecast.

Within this 20 ANEF contour, the land is presently undeveloped and uninhabited. There are no buildings or persons within the 20 ANEF contour for any of the forecast periods.

BROOME AIRPORT

Relocation

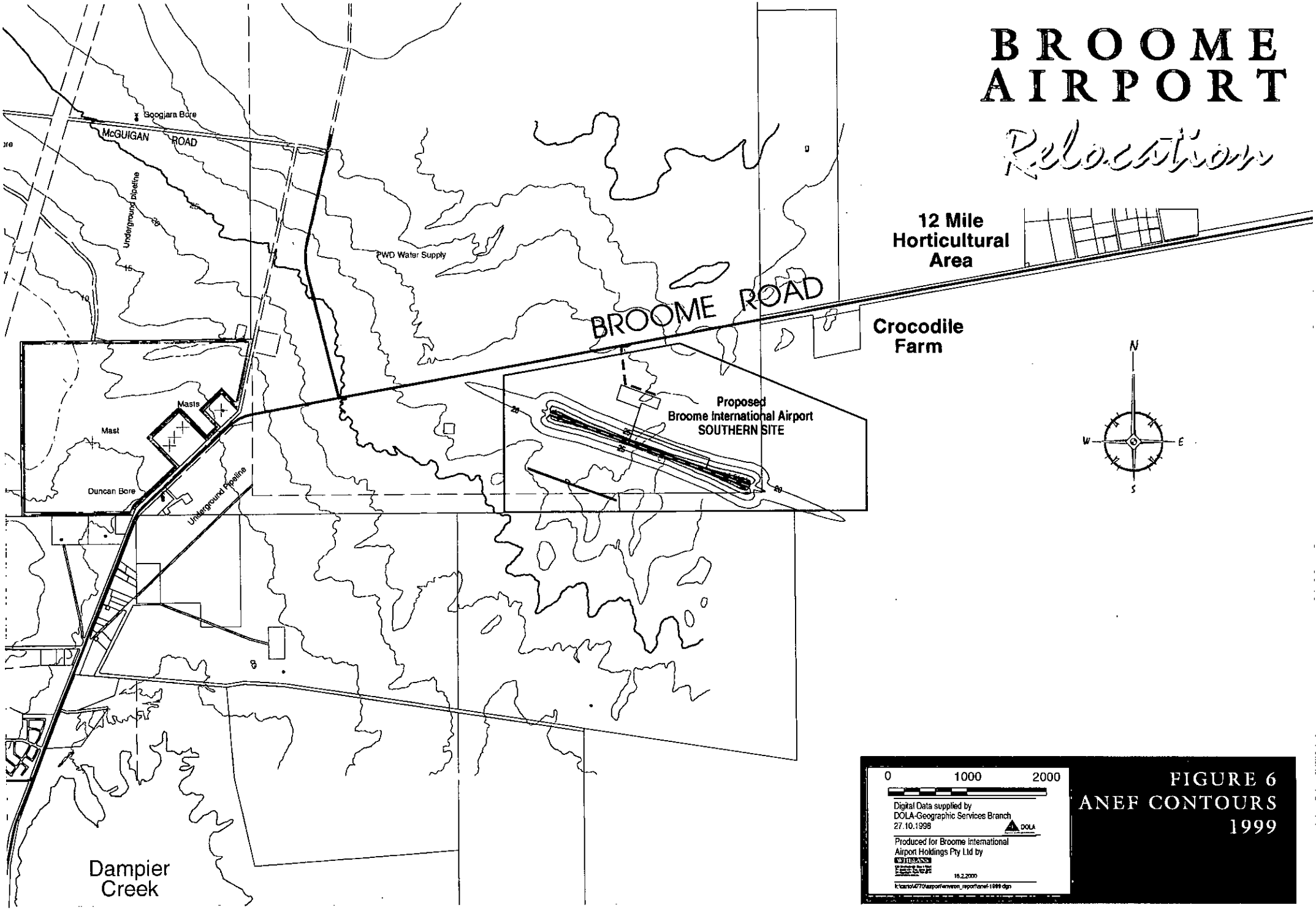
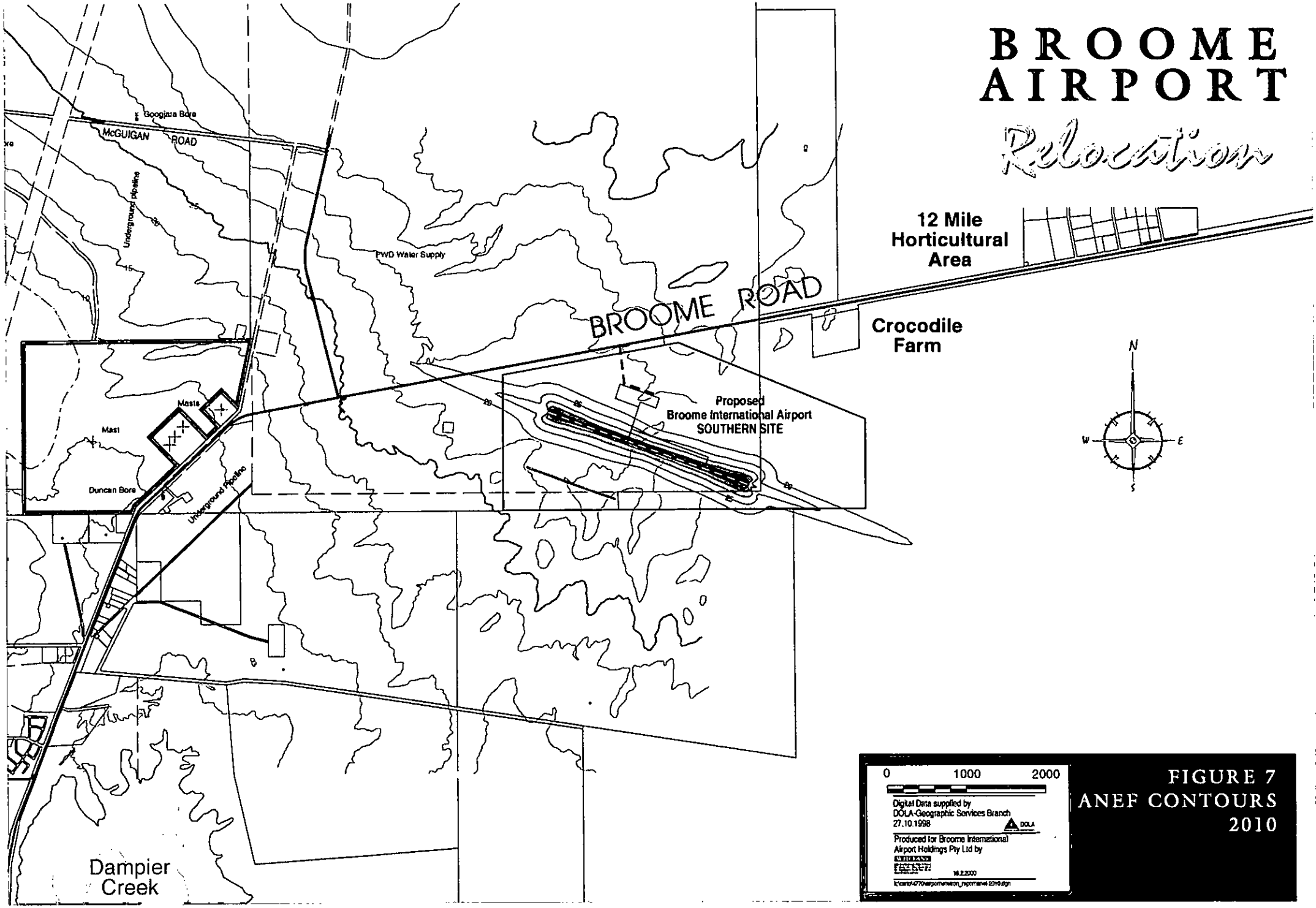


FIGURE 6
ANEF CONTOURS
1999


BROOME AIRPORT
Relocation
12 Mile Horticultural Area
BROOME ROAD
Crocodile Farm
Proposed Broome International Airport SOUTHERN SITE
McGUIGAN ROAD
Googjura Bore
Underground Pipeline
PWD Water Supply
Mast
Mast
Duncan Bore
Underground Pipeline
Dampier Creek
N
W
E
S
0
1000
2000
Digital Data supplied by DOLA-Geographic Services Branch 27.10.1998
DOLA
Produced for Broome International Airport Holdings Pty Ltd by
FIGURE 7
ANEF CONTOURS
2010

BROOME AIRPORT

Relocation

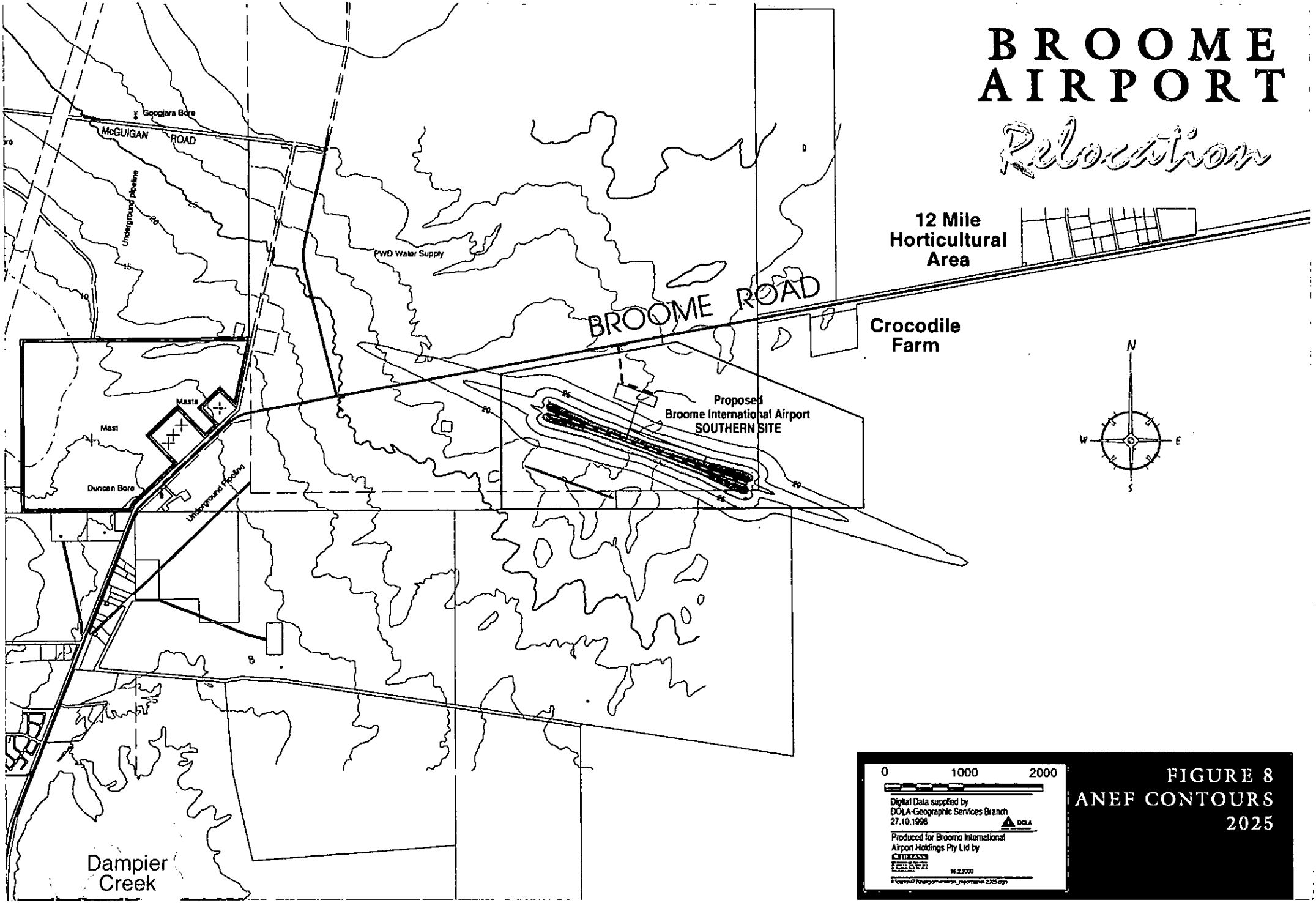


FIGURE 8
ANEF CONTOURS
2025

3.6 Land use planning

The land use planning adjacent to the new Broome International Airport needs to be in accordance with the relevant Australian Standard A2021 - 1994.

It should also be in accordance with the precedent adopted by the Western Australian Planning Commission for Perth International and Jandakot Airports. In 1988, the State Planning Commission (now Western Australian Planning Commission) created a working group to investigate land use planning adjacent to airports with particular reference to Perth International and Jandakot Airports. The working group's recommendations included:

- The adoption of the ANEF system as a basis for determining the extent of aircraft noise nuisance,
- That land use planning authorities adopt the land use compatibility advice published by Commonwealth Aviation Safety Authority (CASA) and included in Australian Standard AS2021-1985 (now AS2021-1994) as a basis for land use zoning and the control of development.
- That the FAC's Ultimate Capacity ANEC for Perth International Airport be used as a basis for land use planning within those areas not currently zoned for residential development with no further residential zoning to take place inside the 25 ANEF noise contour.

The Western Australian Planning Commission adopted these recommendations.

The Australian Standard AS2021-1994 contains recommendations for land use compatibility. The Building Site Acceptability Table from this Standard is reproduced below. New residential and noise sensitive facilities in areas affected by aircraft noise should be constructed to the standards recommended in AS2021-1994.

Table : Land use acceptability based on ANEF zones

Building type	ANEF of zone		
	Acceptable	Conditional	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Notes
1. The actual location of the 20 ANEF contour is difficult to determine mainly because of variation in aircraft flight paths
2. Within 20 to 25 ANEF, some people may find that the land is not compatible with residential or educational uses
3. This is based on Australian Standard AS2021-1994
4. The terms 'acceptable', conditional', and 'unacceptable' are based on the results of two major Australian studies of aircraft noise, quoted in the Perth Airport Master Plan, op.cit.

Broome land use planning

The land use planning adjacent to the new Broome International Airport should be based on AS2021-1994. There is no non-airport development planned or expected within the 20 ANEF contour for any of the forecast periods, and this state of affairs should be maintained by appropriate land use planning.

The landuse planning in the vicinity of the proposed airport site has been included in a study undertaken by the Waterbank Station Co-ordinating Committee which comprises the following agencies:

- Department of Land Administration;
- Shire of Broome;
- Kimberly Land Council;
- Minister of the Premier and Cabinet;
- Department of Conservation and land Management;
- Ministry for Planning; and
- Kimberley Development Commission.

The purpose of the study was to prepare a structure plan proposing potential land-use that will accommodate the future expansion of the Broome townsite including a suitable site for the relocation of the Broome airport. The proposed Waterbank Structure Plan, which identified the location of the new airport, is shown in Figure 9. The proposed land uses surrounding the airport site identified in Figure 9 are the water resource reserve, industrial and pastoral lease. These land uses are considered to be compatible with the airport. The Waterbank Structure Plan is currently before Government for adoption.

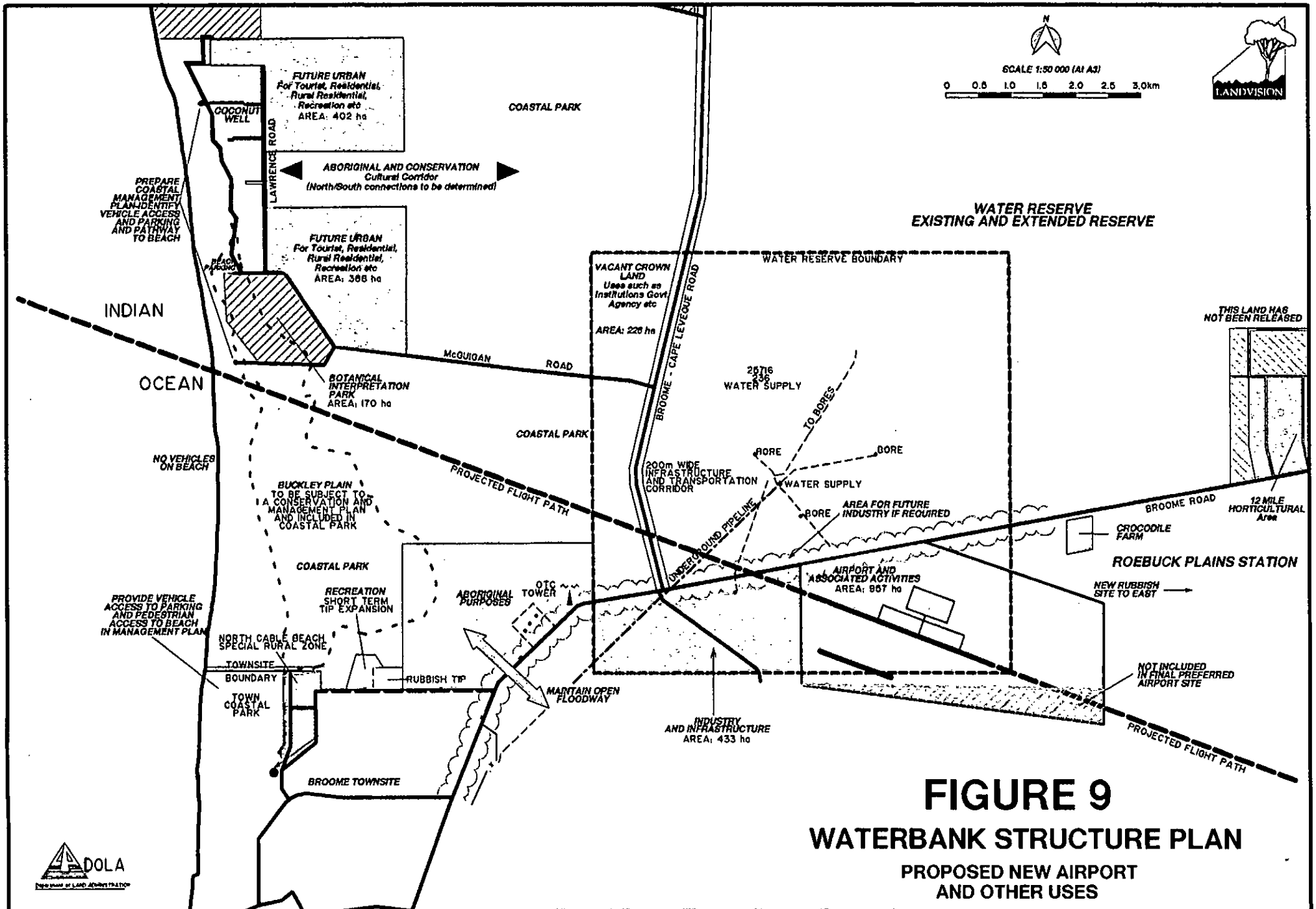


FIGURE 9

WATERBANK STRUCTURE PLAN

PROPOSED NEW AIRPORT AND OTHER USES

Source : WaterBank Structure Plan (Government of Western Australia April 1999)

E:\ES995308\DWG\DRAWINGS\FIGURE9.DGN

Appendix 4

Comparative Size Chart of Aircraft Types

Star Alliance Air Fleet

Aircraft Type	Length (m)	Height	Wing Span	Cruising Speed (km/h)	Engines	Maximum altitudes (m)	Fuel Capacity (L)	Seating
747 – 400 Spaceship	70.7	19.1	64.9	920	4 Pratt and Whitney PW 4056	13,716	216,847	421
787-300 ER Spaceship	54.84	15.85	47.57	870	2GE CF6-80C287F	13,137	91,380	210-214
767-200	48.51	15.85	47.57	870	2GE CF6-80A	13,137	63,216	210-214
A320-211 Skystar	35.57	11.76	34.1	840	2CFM International CFM56-5-A1	11,918	23,860	144
737-337 **737-33A**	33.4	11.13	28.88	820	2CFM International CFM56-3-B1	11,278	20,124	114 115
BAe 148-200	28.58	8.59	26.34	735	4 Avco Lycoming ALF502R-5	9449	12,901	73
Fokker F28-4000	29.61	8.47	25.07	785	2 Rolls Royce RB 183 Mk555-15P	10,668	12,940	63

Appendix 5

Flora Survey Site Descriptions

Site 1:	**Pindan dominated by *Acacia eriopoda*.**	
UTM Location:	Zone 51K; 425 500 mE, 8021 538 mN; ± 20 m.	
Landform:	Sandplain.	
Slope:	Flat.	
Soil:	Red earthy sand.	
Drainage:	Good.	
Organic Litter:	30-70 %.	
Comments:	Unburnt; grazed: moderate condition.	
Trees >5 m	0-2 %:	*Corymbia dampieri, C. zygophylla*
Trees <5 m	0-2 %:	*Planchonia careya*
Shrubs >2 m	30-70 %:	*Acacia colei* var. *colei, A. eriopoda, Gardenia pyriformis* subsp. *keartlandii, Lysiphyllum cunninghamii*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Carissa lanceolata, Distichistemon hispidulus* var. *phyllopterus, Jasminum didymum* subsp. *lineare, Ventilago viminalis*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda, Carissa lanceolata, Hakea macrocarpa, Solanum cunninghamii, Ventilago viminalis*
Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, Crotalaria medicaginea, Gyrostemon tepperi, Hybanthus aurantiacus, Waltheria indica*
Spinifex	30-70 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	10-30 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Glycine tomentella, Mukia maderaspatana, Pterocaulon sphacelatum*

Site 2:	**Pindan dominated by *Acacia eriopoda*.**	
UTM Location:	Zone 51K; 426 454 mE, 8021 243 mN; ± 15 m.	
Landform:	Sandplain.	
Slope:	Flat.	
Soil:	Red earthy sand.	
Drainage:	Good.	
Organic Litter:	30-70 %.	
Comments:	Unburnt; grazed: moderate condition.	
Trees <5 m	0-2 %:	*Corymbia zygophylla*
Shrubs >2 m	30-70 %:	*Acacia eriopoda, A. tumida*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Carissa lanceolata, Gardenia pyriformis* subsp. *keartlandii, Jasminum didymum* subsp. *lineare, Lysiphyllum cunninghamii*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda, Carissa lanceolata, Solanum cunninghamii*
Shrubs <0.5 m	2-10 %:	*Acacia adoxa* var. *subglabra, Bonamia linearis, Corchorus pumilio, C. sidoides, Crotalaria medicaginea, Gyrostemon tepperi*
Spinifex	30-70 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	10-30 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Glycine tomentella, Polymeria ?ambigua, Spermacoce auriculata*

Site 3:	**Pindan dominated by *Acacia eriopoda*.**	
UTM Location:	Zone 51K; 427 443 mE, 8020 926 mN; ± 16 m.	
Landform:	Sandplain.	
Slope:	Flat.	
Soil:	Red earthy sand.	
Drainage:	Good.	
Organic Litter:	30-70 %.	
Comments:	Unburnt; grazed: moderate condition.	
Trees >5 m	0-2 %:	*Brachychiton diversifolius* subsp. *diversifolius, Corymbia zygophylla, Eucalyptus tectifica, Hakea macrocarpa*
Trees <5 m	0-2 %:	*Lysiphyllum cunninghamii, Planchonia careya*
Shrubs >2 m	30-70 %:	*Acacia colei* var. *colei, A. eriopoda*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, A. tumida, Hakea macrocarpa, Lysiphyllum cunninghamii, Ventilago viminalis*
Shrubs 0.5-1 m	0-2 %:	*Acacia adoxa* var. *subglabra, A.eriopoda, A. tumida, Carissa lanceolata, Solanum cunninghamii*

Shrubs <0.5 m	0-2 %:	*Bonamia linearis, Corchorus pumilio, Hybanthus aurantiacus, Jasminum didymum* subsp. *lineare*
Spinifex	10-30 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	70-100 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Buchnera ramosissima, Cajanus marmoratus, Glycine tomentella, Murdannia graminea, Sauropus trachyspermus, Spermacoce auriculata*

Site 4: **Pindan dominated by *Acacia eriopoda* and *Erythrophleum chlorostachys*.**

UTM Location:	Zone 51K; 428 081 mE, 8020 744 mN; ± 17 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	30-70 %.
Comments:	Unburnt; grazed: moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri*
Trees <5 m	0-2 %:	*Brachychiton diversifolius* subsp. *diversifolius, Corymbia zygophylla, Lysiphyllum cunninghamii*
Shrubs >2 m	10-30 %:	*Acacia colei* var. *colei, A. eriopoda, Erythrophleum chlorostachys, Hakea macrocarpa*
Shrubs 1-2 m	2-10 %:	*Acacia eriopoda, Erythrophleum chlorostachys, Ventilago viminalis*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda, Jasminum didymum* subsp. *lineare, Lysiphyllum cunninghamii, Sida* sp., *Waltheria indica*
Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, C. sidoides, Crotalaria medicaginea, Hybanthus aurantiacus*
Spinifex	2-10 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Aristida holathera* var. *holathera, Eriachne melicacea*
Herbs	0-2 %:	*Buchnera ramosissima, Cajanus marmoratus, Evolvulus alsinoides, Goodenia sepalosa, Heliotropium* sp. *(?diversifolium), Sauropus trachyspermus, Spermacoce auriculata*

Site 5: **Pindan dominated by *Acacia eriopoda*.**

UTM Location:	Zone 51K; 425 419 mE, 8022 286 mN; ± 17 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	70-100 %.
Comments:	Unburnt; grazed: moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri, C. flavescens, Planchonia careya*
Trees <5 m	0-2 %:	*Corymbia flavescens*
Shrubs >2 m	30-70 %:	*Acacia colei* var. *colei, A.eriopoda, Lysiphyllum cunninghamii, Persoonia falcata*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Lysiphyllum cunninghamii*
Shrubs 0.5-1 m	0-2 %:	*Acacia adoxa* var. *subglabra, A. eriopoda, Gardenia pyriformis* subsp. *keartlandii, Jasminum didymum* subsp. *lineare, Lysiphyllum cunninghamii, Pterocaulon sphacelatum, Ventilago viminalis*
Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, C. sidoides, Crotalaria medicaginea, Melhania oblongifolia, Sida* sp., *Waltheria indica*
Spinifex	2-10 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Buchnera ramosissima, Glycine tomentella, Spermacoce auriculata*

Site 6:Pindan dominated by *Acacia eriopoda.*

UTM Location:	Zone 51K; 426 440 mE, 8022 457 mN; ± 15 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	30-70 %.
Comments:	Unburnt; grazed; some clearing: moderate condition.

Trees >5 m	0-2 %:	*Corymbia flavescens*
Trees <5 m	0-2 %:	*Corymbia dampieri*
Shrubs >2 m	30-70 %:	*Acacia eriopoda, Lysiphyllum cunninghamii*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Carissa lanceolata, Cullen corallum, Jasminum didymum* subsp. *lineare, Lysiphyllum cunninghamii*
Shrubs 0.5-1 m	0-2 %:	*Jasminum didymum* subsp. *lineare, Solanum cunninghamii*
Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, C. sidoides, Hakea macrocarpa, Hybanthus aurantiacus, Waltheria indica*
Spinifex	10-30 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	70-100 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Cajanus marmoratus, Glycine tomentella, Murdannia graminea, Polymeria ?ambigua, Spermacoce auriculata*

Site 7: **Pindan dominated by *Acacia eriopoda.***

UTM Location:	Zone 51K; 427 300 mE, 8022 591 mN; ± 16 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	70-100 %.
Comments:	Grazing; some clearing for Optus optic fibre cable; some fire effects near fenceline: moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri*
Trees <5 m	0-2 %:	*Ficus opposita, Hakea macrocarpa*
Shrubs >2 m	30-70 %:	*Acacia eriopoda, Lysiphyllum cunninghamii, Tinospora smilacina*
Shrubs 1-2 m	0-2 %:	*Acacia colei* var. *colei, A. eriopoda, Cullen corallum, Hakea macrocarpa, Ventilago viminalis*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda, Cullen corallum, Jasminum didymum* subsp. *lineare*
Shrubs <0.5 m	0-2 %:	*Bonamia linearis, Corchorus pumilio, C. sidoides, Waltheria indica*
Spinifex	2-10 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Cajanus marmoratus, Glycine tomentella, Spermacoce auriculata*

Site 8: **Pindan dominated by *Acacia eriopoda.***

UTM Location:	Zone 51K; 428 245 mE, 8022 779 mN; ± 15 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	70-100 %.
Comments:	Grazed relatively heavily; some fire effects?: moderate to poor condition.

Trees >5 m	0-2 %:	*Corymbia dampieri, Hakea macrocarpa, Planchonia careya, Ventilago viminalis*
Trees <5 m	0-2 %:	*Brachychiton diversifolius* subsp. *diversifolius, Ficus opposita, Lysiphyllum cunninghamii*
Shrubs >2 m	30-70 %:	*Acacia colei* var. *colei, A. eriopoda*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Grewia retusifolia, Lysiphyllum cunninghamii*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda, Jasminum didymum* subsp. *lineare, Ventilago viminalis*

Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, Crotalaria medicaginea, Pterocaulon sphacelatum, Sida* sp., *Waltheria indica*
Spinifex	2-10 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Aristida holáthera* var. *holathera*
Herbs	0-2 %:	*Buchnera ramosissima, Cajanus marmoratus, Glycine tomentella, Goodenia sepalosa, Mukia maderaspatana, Murdannia graminea, Polycarpaea longiflora, Spermacoce auriculata*

Site 9: **Pindan dominated by *Acacia eriopoda*.**

UTM Location:	Zone 51K; 428 215 mE, 8021 769 mN; ± 15 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	70-100 %.
Comments:	Unburnt; grazed: moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri, Gyrocarpus americanus* subsp. *pachyphyllus, Owenia reticulata*
Trees <5 m	0-2 %:	*Lysiphyllum cunninghamii*
Shrubs >2 m	30-70 %:	*Acacia eriopoda, Hakea macrocarpa*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Hakea macrocarpa, Lysiphyllum cunninghamii*
Shrubs 0.5-1 m	0-2 %:	*Carissa lanceolata*
Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, Pterocaulon sphacelatum, Solanum cunninghamii, Waltheria indica, Zornia chaetophora*
Spinifex	2-10 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Aristida holathera* var. *holathera*
Herbs	0-2 %:	*Buchnera ramosissima, Glycine tomentella, Mukia maderaspatana, Murdannia graminea, Spermacoce auriculata*

Site 10: **Pindan dominated by *Acacia eriopoda*.**

UTM Location:	Zone 51K; 427 527 mE, 8020 421 mN; ± 15 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	70-100 %.
Comments:	Unburnt; grazed: moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri, C. flavescens, Eucalyptus tectifica, Lysiphyllum cunninghamii*
Shrubs >2 m	30-70 %:	*Acacia colei* var. *colei, A. eriopoda, Hakea macrocarpa*
Shrubs 1-2 m	0-2 %:	*Acacia eriopoda, Carissa lanceolata*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda*
Shrubs <0.5 m	0-2 %:	*Carissa lanceolata, Corchorus pumilio, Solanum cunninghamii*
Spinifex	2-10 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	70-100 %:	*Sorghum plumosum*
Herbs	0-2 %:	*Buchnera ramosissima, Cajanus marmoratus, Murdannia graminea, Polymeria ?ambigua, Spermacoce auriculata*

Site 11: **Pindan dominated by *Acacia eriopoda*.**

UTM Location:	Not recorded; ~1.5 km west of Site 10.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	70-100 %.
Comments:	Grazing?: good to moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri*
Trees <5 m	0-2 %:	*Hakea macrocarpa*
Shrubs >2 m	70-100 %:	*Acacia colei* var. *colei, A. eriopoda, A. tumida, Gardenia pyriformis* subsp. *keartlandii*

Shrubs 1-2 m	10-30 %:	*Acacia eriopoda, Distichistemon hispidulus* var. *phyllopterus*
Shrubs 0.5-1 m	0-2 %:	*Carissa lanceolata, Solanum cunninghamii*
Shrubs <0.5 m	0-2 %:	*Corchorus pumilio, Gardenia pyriformis* subsp. *keartlandii, Hybanthus aurantiacus, Zornia prostrata* var. *prostrata*
Spinifex	10-30 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	70-100 %:	*Aristida holathera* var. *holathera, Sorghum plumosum*
Herbs	0-2 %:	*Cajanus marmoratus, Spermacoce auriculata, Tephrosia leptoclada, Tephrosia* sp. D

Site 12:	**Burnt *Acacia eriopoda* pindan.**
UTM Location:	Zone 51K; 428 195 mE, 8021 346 mN; ± 17 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	30-70 %.
Comments:	Relatively recently burnt; grazed: moderate condition.

Trees >5 m	0-2 %:	*Corymbia dampieri, C. flavescens, Eucalyptus tectifica, Hakea macrocarpa*
Trees <5 m	0-2 %:	*Brachychiton diversifolius* subsp. *diversifolius, Corymbia zygophylla, Terminalia cunninghamii*
Shrubs >2 m	2-10 %:	*Acacia eriopoda, Gardenia pyriformis* subsp. *keartlandii, Lysiphyllum cunninghamii*
Shrubs 1-2 m	0-2 %:	*Lysiphyllum cunninghamii*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda*
Shrubs <0.5 m	0-2 %:	*Acacia eriopoda, A. tumida, Carissa lanceolata, Corchorus pumilio, C. sidoides, Solanum cunninghamii*
Spinifex	0-2 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Sorghum plumosum*
Herbs	0-2 %:	*Cajanus marmoratus, Chamaecrista pumila, Glycine tomentella, Mukia maderaspatana, Polymeria ?ambigua, Spermacoce auriculata*

Site 13:	**Burnt *Acacia eriopoda* pindan.**
UTM Location:	Zone 51K; 430 000 mE, 8020 522 mN; ± 17 m.
Landform:	Sandplain.
Slope:	Flat.
Soil:	Red earthy sand.
Drainage:	Good.
Organic Litter:	10-30 %.
Comments:	Relatively recently burnt; grazed: moderate condition.

Trees >5 m	0-2 %:	*Corymbia zygophylla, Eucalyptus tectifica*
Trees <5 m	0-2 %:	*Hakea macrocarpa, Planchonia careya*
Shrubs >2 m	0-2 %:	*Acacia eriopoda*
Shrubs 1-2 m	0-2 %:	*Lysiphyllum cunninghamii, Ventilago viminalis*
Shrubs 0.5-1 m	0-2 %:	*Acacia eriopoda, Capparis lasiantha, Grewia retusifolia*
Shrubs <0.5 m	2-10 %:	*Acacia eriopoda, Corchorus pumilio, C. sidoides, Sida rohlenae*
Spinifex	0-2 %:	*Triodia (Plectrachne) schinzii*
Other Grasses	30-70 %:	*Aristida holathera* var. *holathera, Eriachne obtusa, Sorghum plumosum*
Herbs	0-2 %:	*Buchnera ramosissima, Glycine tomentella, Polygala tepperi, Polymeria ?ambigua, Spermacoce auriculata*

Appendix 6

Vascular Flora Species List

FAMILY	Species
POACEAE	*Aristida holathera* var. *holathera*
	Eriachne melicacea
	Eriachne obtusa
	Sorghum plumosum
	Triodia (Plectrachne) schinzii
COMMELINACEAE	*Murdannia graminea*
MORACEAE	*Ficus opposita*
PROTEACEAE	*Hakea macrocarpa*
	Persoonia falcata
LORANTHACEAE	*Amyema ?bifurcata*
GYROSTEMONACEAE	*Gyrostemon tepperi*
CARYOPHYLLACEAE	*Polycarpaea longiflora*
MENISPERMACEAE	*Tinospora smilacina*
GYROCARPACEAE	*Gyrocarpus americanus* subsp. *pachyphyllus*
CAPPARACEAE	*Capparis lasiantha*
MIMOSACEAE	*Acacia adoxa* var. *subglabra*
	Acacia colei var. *colei*
	Acacia eriopoda
	Acacia tumida
CAESALPINIACEAE	*Chamaecrista pumila*
	Erythrophleum chlorostachys
	Lysiphyllum cunninghamii
	**Senna occidentalis*
PAPILIONACEAE	*Cajanus marmoratus*
	Crotalaria medicaginea
	Cullen corallum
	Glycine tomentella
	Tephrosia leptoclada
	Tephrosia remotiflora
	Tephrosia sp. D
	Zornia chaetophora
	Zornia prostrata var. *prostrata*
MELIACEAE	*Owenia reticulata*
POLYGALACEAE	*Polygala tepperi*
EUPHORBIACEAE	**Jatropha gossypiifolia*
	Sauropus trachyspermus
SAPINDACEAE	*Distichistemon hispidulus* var. *phyllopterus*
RHAMNACEAE	*Ventilago viminalis*
TILIACEAE	*Corchorus pumilio*
	Corchorus sidoides
	Grewia retusifolia
MALVACEAE	*Sida rohlenae*
	Sida sp.
STERCULIACEAE	*Brachychiton diversifolius* subsp. *diversifolius*
	Melhania oblongifolia
	Waltheria indica
VIOLACEAE	*Hybanthus aurantiacus*
LECYTHIDACEAE	*Planchonia careya*
COMBRETACEAE	*Terminalia cunninghamii*
MYRTACEAE	*Corymbia dampieri*
	Corymbia flavescens
	Corymbia zygophylla
	Eucalyptus tectifica
OLEACEAE	*Jasminum didymum* subsp. *lineare*
APOCYNACEAE	*Carissa lanceolata*

FAMILY	Species
CONVOLVULACEAE	*Bonamia linearis*
	Evolvulus alsinoides
	Polymeria ?ambigua
BORAGINACEAE	*Heliotropium* sp. (*?diversifolium*)
	Trichodesma zeylanicum
LAMIACEAE	**Ocimum basilicum*
SOLANACEAE	*Solanum cunninghamii*
SCROPHULARIACEAE	*Buchnera ramosissima*
RUBIACEAE	*Gardenia pyriformis* subsp. *keartlandii*
	Oldenlandia mitrasacmoides
	Spermacoce auriculata
CUCURBITACEAE	*Mukia maderaspatana*
GOODENIACEAE	*Goodenia sepalosa*
	Velleia panduriformis
ASTERACEAE	*Pterocaulon sphacelatum*

Appendix 7

Relevant Correspondence

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

HEAD OFFICE
HACKETT DRIVE CRAWLEY
WESTERN AUSTRALIA
Phone (08) 9442 0300
Facsimile (08) 9386 1578

STATE OPERATIONS HEADQUARTERS
50 HAYMAN ROAD COMO
WESTERN AUSTRALIA
Phone (08) 9334 0333
Facsimile (08) 9334 0466
Teletype (08) 9334 0546

Please address all correspondence to Executive Director, Locked Bag 104, Bentley Delivery Centre W.A. 6983

Your Ref:
Our Ref: 042472F0801
Enquiries: Dr. Peter Mawson
Phone: 08 93340421

Mr Roy Teale
Halpern Glick Maunsell
629 Newcastle Street
LEEDERVILLE WA 6007

Dear Mr Teale

REQUEST FOR THREATENED FAUNA INFORMATION

I refer to your request of 16 February for information on threatened fauna occuring in the Boome area.

A search was undertaken for this area of the Department's Threatened Fauna database, which includes species which are declared as *'Rare or likely to become extinct* (Schedule 1)', *'Birds protected under an international agreement* (Schedule 3)', and *'Other specially protected fauna* (Schedule 4)'. Attached are print outs from these databases where records were found.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the sixth point that refers to the requirement to undertake field investigations for the accurate determination of threatened fauna occurrence at a site. The information supplied should be regarded as an indication only of the threatened fauna that may be present.

An invoice for $50.00, being the set charge for the supply of this information, will be forwarded.

It would be appreciated if any populations of threatened fauna encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss threatened fauna management, please contact my Senior Zoologist, Dr Peter Mawson on 08 93340421.

Yours faithfully

.....
for Syd Shea
EXECUTIVE DIRECTOR

19 February, 1999.

The search of the database indicated that the following threatened and priority fauna occur in the area in question.

Schedule 1 (Fauna which is Rare or likely to become Extinct)

Bilby (***Macrotis lagotis***) This species was last recorded in the area in question in August 1970. It is unlikley that the Bilby still persists this close to Broome now, as all recent records have come from an area some 90km or more NE of Broome along the Great Northern Highway.

Schedule 4 (Fauna which is Otherwise Specially Protected)

Peregrine Falcon (***Falco peregrinus***) This species is an occasional visitor to those areas of open scubland and along margins of creeklines.

Priority Taxa

Vermicella minima **P2** This species is restricted to Dampier Land in the Kimberley and its range extends to and area slightly south of the Broome townsite.

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

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Phone (08) 9334 0333
Facsimile (08) 9334 0466
Teletype (08) 9334 0546

Please address all correspondence to Executive Director, Locked Bag 104, Bentley Delivery Centre W.A. 6983

Your Ref:
Our Ref: 042494F0801
Enquiries: Dr Atkins
Phone: (08) 9334 0425

Halpern Glick Maunsell
629 Newcastle Street
LEEDERVILLE WA 6007

Attention: Michi Maier

RECEIVED
17 FEB 1999
Halpern Glick Maunsell

Dear Ms Maier

REQUEST FOR RARE FLORA INFORMATION

I refer to your request of 15 February 1999 for information on rare flora in the Broome area. The search co-ordinates used were 17^0 45' - 18^0 0' & 122^0 10' - 122^0 26'.

A search was undertaken for this area of (**1**) the Department's *Threatened (Declared Rare) Flora* database (for results, if any, see "Summary of Threatened Flora Data"), (**2**) the Department's *Priority Species List* [this list contains species that are declared rare (Conservation Code R and/or T, or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) – for results, if any, see "Declared Rare and Priority Flora List"] and (**3**), the *Western Australian Herbarium Specimen* database for priority species opportunistically collected in the area of interest (for results, if any, see "WAHERB Specimen Database General Enquiry").

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the seventh point which refers to the requirement to undertake field investigations for the accurate determination of rare flora occurrence at a site. *The information supplied should be regarded as an indication only of the rare flora that may be present.*

An invoice for $150, being the set charge for the supply of this information, will be forwarded.

It would be appreciated if any populations of rare flora encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss rare flora management, please contact my Principal Botanist, Dr Ken Atkins, on (08) 93340425.

Yours faithfully

J. Riley

.....
for Syd Shea
EXECUTIVE DIRECTOR

16 February, 1999

Attached

DECLARED RARE AND PRIORITY FLORA LIST

SPECIES/TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
Glycine pindanica	1	K	Broome, Beagle Bay	Feb-Apr
Keraudrenia sp. Broome (BJ Carter 501)	1	K	Broome	
Nicotiana heterantha	1	K	Broome, Dampier Peninsula	May-Jun
Pandanus spiralis var. flammeus	R	K	SE of Broome	Nov
Pittosporum moluccanum	4	K,*	Dampier Peninsula, N of Broome, Berthier Is., Maret Is., Northern Territory, SE Asia	Feb-Aug

WAHERB SPECIMEN DATABASE
GENERAL ENQUIRY

Nicotiana heterantha
Symon & Kenneally (Solanaceae)
CONSERVATION STATUS: P1
Coll.: P.R. Foulkes 237 Date: 19 05 1985 (PERTH 1943243)
LOCALITY Coconut Well, 15 km N of Broome, Dampier Peninsula WA
Lat.: 17^ 51' " S Long.: 122^ 15' " E
Creeper 0.5 m, flowers white, open at night. In Melaleuca acacioid
es forest.
Abundance: uncommon
Previous det.: Nicotiana sp.

Nicotiana heterantha
Symon & Kenneally (Solanaceae)
CONSERVATION STATUS: P1
Coll.: J.B. Martin 225 Date: 08 03 1992 (PERTH 02169819)
LOCALITY Buckleys Bore, 11 km N of Broome, Dampier Peninsula WA
Lat.: 17^ 51' " S Long.: 122^ 13' " E
Lax herb, flowers white.
Previous det.: Nicotiana aff. benthamiana Domin

Nicotiana heterantha
Symon & Kenneally (Solanaceae)
CONSERVATION STATUS: P1
Coll.: J.B. Martin 226 Date: 24 04 1992 (PERTH 02169827)
LOCALITY Buckleys Plain, OTC side, 7 km N of Broome, Dampier Peninsula WA
Lat.: 17^ 53' " S Long.: 122^ 15' " E
Lax herb, flowers white.
Previous det.: Nicotiana aff. benthamiana Domin

Nicotiana heterantha
Symon & Kenneally (Solanaceae)
CONSERVATION STATUS: P1
Coll.: K.F. Kenneally KFK 11338 Date: 01 09 1992 (PERTH 02465264)
LOCALITY Buckleys Plain, 10 km N of Broome behind OTC station, Dampier Peninsula
WA
Lat.: 17^ 52' " S Long.: 122^ 15' " E
Dense clumped subshrub to 40 cm, leaves green, fleshy; flowers creamish with
pale maroon striations on corolla tube. Outer corolla lobes suffused maroon.
On seasonally wet black clay adjacent to thickets. In Melaleuca acacioides t
hicket.
Previous det.: Nicotiana sp.

Nicotiana heterantha
Symon & Kenneally (Solanaceae)
CONSERVATION STATUS: P1 TYPE STATUS: ISO
Coll.: J.B. Martin 225 Date: 08 03 1992 (PERTH 04085884)
LOCALITY Buckleys Bore, 11 km N of Broome, Dampier Peninsula WA
Lat.: 17^ 51' " S Long.: 122^ 13' " E
Lax herb, flowers white.
Previous det.: Nicotiana aff. benthamiana Domin

Western Australian museum

Francis Street, Perth
Western Australia 6000
Telephone (08) 9427 2700
Facsimile (08) 9427 2882

15 December 1999

Mr Roy Teale
Halpern Glick Maunsell Pty Ltd
629 Newcastle Street
LEEDERVILLE WA 6007

Dear Mr Teale

Please find enclosed computer printouts of the Museum's database for the mammals and herpetofauna of the Dampier Peninsula as requested in your fax dated 14 December 1999.

In accordance with the policy of the Trustees of the Museum, these data are provided subject to the following conditions:

- The Western Australian Museum shall at all times retain ownership and copyright over the data supplied.
- None of the data provided may be disposed of in any form to any other individual or institution without prior written consent of the Director of the W.A. Museum;
- The data may not be used for any purpose other than for the project for which they have been provided without the prior written consent of the Director of the W.A. Museum.
- The data must not be placed on any computing network or multi-user system on which its security may be compromised.
- On completion of the project for which the data have been provided, all digital records must be expunged from your computer system.
- Receiving organisations must recognise that while every reasonable effort has been made to prevent errors and omissions in the data set provided, they may be present; the W.A. Museum takes no responsibility for this;
- Receiving organisations must recognise that our data base from which sets have been provided is subject to continual updating and amendment, and such considerations should be taken into account by the user;
- It should be noted that the printout does not necessarily represent a comprehensive listing of the fauna of the area in question. Its comprehensiveness is dependant on the amount of collection that has been done there;
- Acknowledgment of the Western Australian Museum as the source and owner of the data is to be made in any published material using them; copies of all such publications are to be forwarded to the Museum.

On the basis of our standard charge of $96 per hour or part thereof the charge for these database searches is $96.00. An invoice will be forwarded under separate cover.

Yours sincerely

D.S. JONES
A/Director, Museum of Natural Science

Museum of Natural Science
Francis Street, Perth
Western Australia 6000
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Facsimile (08) 9427 2882

Western Australian Maritime Museum
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Fremantle History Museum
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Facsimile (08) 9921 5158

Albany Residency Museum
Residency Road, Albany
Western Australia 6330
Telephone (08) 9841 4844
Facsimile (08) 9841 4027

Museum of the Goldfields
PO Box 25, Kalgoorlie
Western Australia 6430
Telephone (08) 9021 8533
Facsimile (08) 9091 2791

Western Australian museum of Natural Science

Search of **MAMMAL** database for **Hgm** 12/14/1999

Search coordinates are:

Northern Latitude 17°S

Southern Latitude 18°S

Western Longitude 122°E

Eastern Longitude 123°E

Family	Genus	Species
Delphinidae	Orcaella	brevirostris
Dugongidae	Dugong	dugon
Emballonuridae	Saccolaimus	flaviventris
~~Hominidae~~	~~Homo~~	~~sapiens~~
Macropodidae	Macropus	agilis
Molossidae	Chaerephon	jobensis
Molossidae	Mormopterus	loriae
~~Muridae~~		
Muridae	Mus	musculus
~~Muridae~~	~~Pseudomys~~	
Muridae	Pseudomys	delicatulus
Muridae	Pseudomys	nanus
Muridae	Rattus	rattus
Phalangeridae	Trichosurus	arnhemensis
Pteropodidae	Pteropus	scapulatus
Thylacomyidae	Macrotis	lagotis
Vespertilionidae	Chalinolobus	gouldii
Vespertilionidae	Chalinolobus	nigrogriseus
Vespertilionidae	Miniopterus	schreibersii
Vespertilionidae	Nyctophilus	arnhemensis
Vespertilionidae	Nyctophilus	bifax
Vespertilionidae	Nyctophilus	geoffroyi
Vespertilionidae	Scotorepens	balstoni
Vespertilionidae	Scotorepens	greyii
Vespertilionidae	Vespadelus	~~pumilus~~ ? caurinus/ douglasorum

Western Australian museum of Natural Science

Search of **REPTILE** database for **Hgm** 12/14/1999

Search coordinates are:

Northern Latitude 17°S

Southern Latitude 18°S

Western Longitude 122°E

Eastern Longitude 123°E

Family	Genus	Species	Subspecies
Agamidae	Chelosania	brunnea	
Agamidae	Chlamydosaurus	kingii	
Agamidae	Ctenophorus	inermis	
Agamidae	Ctenophorus	isolepis	isolepis
~~Agamidae~~	~~Diporiphora~~		
Agamidae	Diporiphora	magna	
Agamidae	Diporiphora	pindan	
Agamidae	Diporiphora	winneckei	
Agamidae	Lophognathus	gilberti	gilberti
Agamidae	Pogona	minor	mitchelli
Boidae	Antaresia	childreni	
Boidae	Antaresia	stimsoni	
Boidae	Antaresia	stimsoni	stimsoni
Boidae	Aspidites	melanocephalus	
Boidae	Liasis	mackloti	
Boidae	Liasis	olivaceus	olivacea
Cheloniidae	Chelonia	mydas	japonica
Cheloniidae	Eretmochelys	imbricata	bissa
Colubridae	Dendrelaphis	punctulatus	
Colubridae	Fordonia	leucobalia	
Elapidae	Demansia	olivacea	
Elapidae	Demansia	rufescens	
Elapidae	Furina	ornata	
Elapidae	Pseudonaja	nuchalis	
Elapidae	Simoselaps	approximans	
Elapidae	Simoselaps	minima	
Elapidae	Suta	punctata	
Gekkonidae	Diplodactylus	ciliaris	aberrans
Gekkonidae	Diplodactylus	conspicillatus	
Gekkonidae	Diplodactylus	stenodactylus	
Gekkonidae	Diplodactylus	strophurus	
~~Gekkonidae~~	~~Gehyra~~		
Gekkonidae	Gehyra	nana	
Gekkonidae	Gehyra	pilbara	
Gekkonidae	Heteronotia	binoei	
Gekkonidae	Oedura	rhombifera	
Gekkonidae	Rhynchoedura	ornata	
Hydrophiidae	Acalyptophis	peronii	
Hydrophiidae	Aipysurus	apraefrontalis	
Hydrophiidae	Aipysurus	eydouxii	
Hydrophiidae	Aipysurus	laevis	
Hydrophiidae	Aipysurus	tenuis	

Family	Genus	Species	Subspecies
Hydrophiidae	Astrotia	stokesii	
Hydrophiidae	Ephalophis	greyi	
Hydrophiidae	Hydrelaps	darwiniensis	
Hydrophiidae	Hydrophis	major	
Hylidae	Cyclorana	australis	
Hylidae	Cyclorana	longipes	
Hylidae	Litoria	caerulea	
Hylidae	Litoria	rothii	
Hylidae	Litoria	rubella	
Myobatrachidae	Limnodynastes	ornatus	
Myobatrachidae	Notaden	nichollsi	
Myobatrachidae	Uperoleia		
Myobatrachidae	Uperoleia	aspera	
Myobatrachidae	Uperoleia	mjobergi	
Myobatrachidae	Uperoleia	talpa	
Pygopodidae	Delma	tincta	
Pygopodidae	Lialis	burtonis	
Scincidae	Carlia	munda	
Scincidae	Carlia	rufilatus	
Scincidae	Cryptoblepharus		
Scincidae	Cryptoblepharus	carnabyi	
Scincidae	Cryptoblepharus	plagiocephalus	
Scincidae	Ctenotus	colletti	
Scincidae	Ctenotus	inornatus	
Scincidae	Ctenotus	saxatilis	
Scincidae	Glaphyromorphus	isolepis	
Scincidae	Glaphyromorphus	isolepis	isolepis
~~Scincidae~~	~~Lerista~~		
Scincidae	Lerista	apoda	
Scincidae	Lerista	bipes	
Scincidae	Lerista	greeri	
Scincidae	Lerista	griffini	
Scincidae	Lerista	labialis	
Scincidae	Lerista	separanda	
Scincidae	Menetia	maini	
Scincidae	Morethia	ruficauda	
Scincidae	Morethia	ruficauda	ruficauda
Scincidae	Morethia	storri	
Scincidae	Proablepharus	tenuis	
Scincidae	Tiliqua	multifasciata	
Scincidae	Tiliqua	scincoides	intermedia
Typhlopidae	Ramphotyphlops	diversus	~~ammodytes~~ diversus
Typhlopidae	Ramphotyphlops	diversus	diversus
Typhlopidae	Ramphotyphlops	grypus	
Varanidae	Varanus	acanthurus	
Varanidae	Varanus	brevicauda	
Varanidae	Varanus	gouldii	
Varanidae	Varanus	scalaris	
Varanidae	Varanus	tristis	tristis

AUSTRALIAN HERITAGE
COMMISSION

Our reference: 99/10437
Contact Officer: Lyn Wall (Mrs)
Phone: (02) 6274 2152
Your reference: ES995308

30 November 1999

Mr Paul West
Halpern Glick Maunsell
629 Newcastle Street
LEEDERVILLE WA 6007

Proposed International Airport Relocation Broome Area

Dear Mr West

Thank you for your enquiry of 1 November 1999, I wish to advise that there are Register of the National Estate places within your area of interest.

The Register is a list of places with heritage values which should be conserved for present and future generations. Information on registered places is available to the public and all levels of government to assist them to consider heritage values in their decision making process. Under the *Australian Heritage Commision Act 1995,* the Commonwealth Government is required to avoid damaging places in the Register and to inform the Commission of any proposed action which might significantly effect a place in the Register or in the Interim List.

Because the Register of the National Estate is not a comprehensive inventory the Commission asks you to consider the potential for other heritage places (Aboriginal, Historic and Natural) and to consult with relevant State agencies.

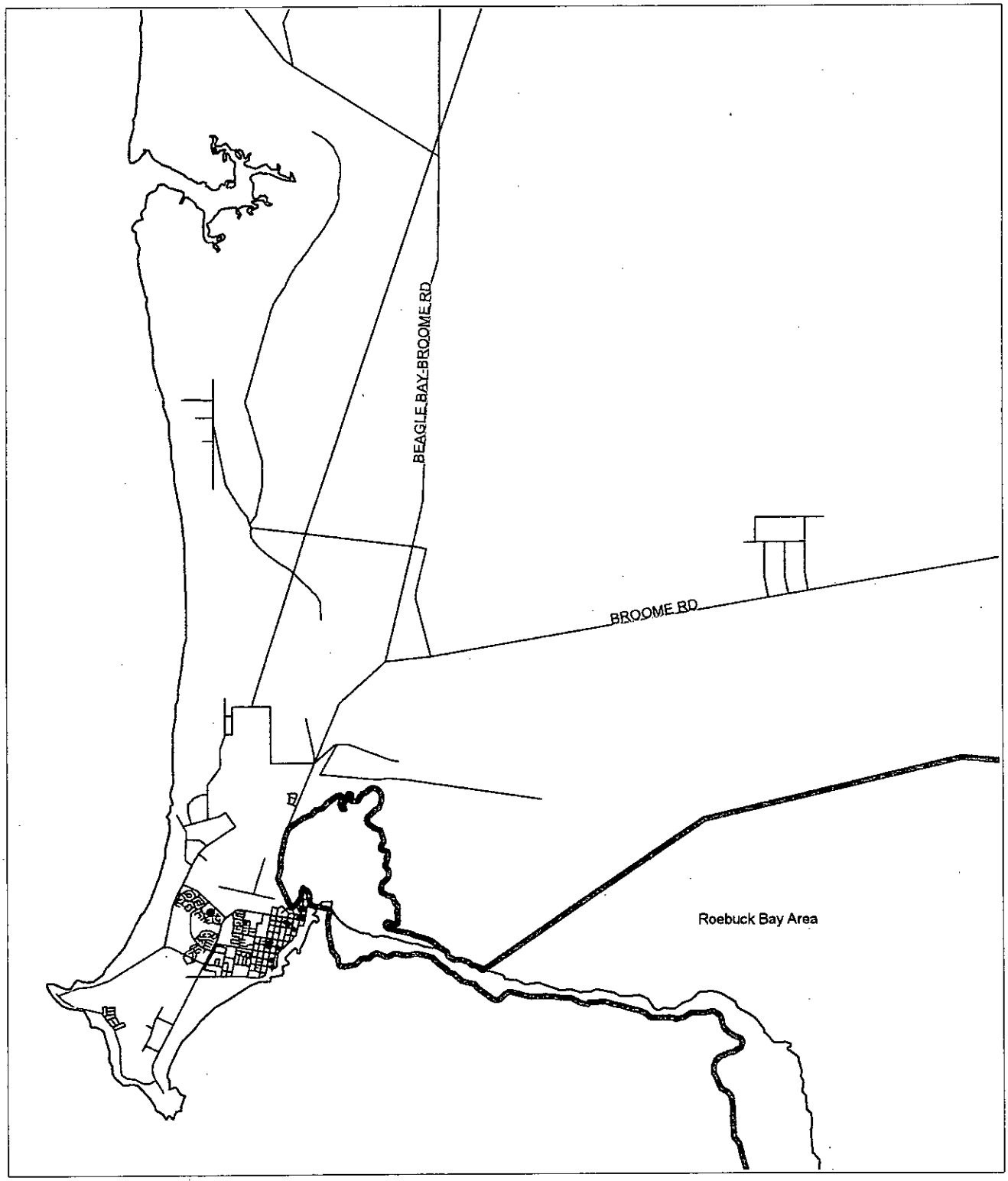
I have enclosed maps and relevant database reports. If you have any further enquires do not hesitate to contact us allowing a minimum of three weeks for a reply. The Register of the National Estate Database is accessible through the Internet, our home page address is www.ahc.gov.au where information and database reports are available free of charge.

Yours sincerely

for Robert Bruce
Director
Register of the National Estate Section

AUSTRALIAN HERITAGE COMMISSION

Reloaction of Broome International Airport RNE Search



Interim-rne-removed.shp
- Aboriginal
- Historic
- Natural

Rne layer 1.shp
- Aboriginal
- Historic
- Natural

5 0 5 10 Kilometers

N W E S

Appendix 8

Bird Strike and Fog Survey and Risk Assessment

Broome International Airport Holdings

Relocation of
Broome International Airport

Report on Bird and Fog survey February 2000

KUBU

February 2000
Professor Stephen Emery
Kubu Australia Pty Ltd, Perth

EXECUTIVE SUMMARY

Preliminary comments received on the draft Public Environmental Review for the relocated Broome airport included a question about the risk of birdstrikes at the new airport site.

There is a fairly small risk of birdstrike at the existing airport. Records at the existing airport show that in twelve months preceding this report, there were five strikes. The airport has in place appropriate bird hazard control measures in accordance with ICAO recommendations. To gather historical operational aviation experience on the matter, a survey was conducted of general aviation pilots flying in the Broome area. This was in accordance with recommended ICAO practice.

The survey included pilots of single and twin-engined aircraft, both piston and turboprop. Their experience in terms of total number of flights in the Broome MBZ was 15,550 flights, which is substantial. They had experienced one birdstrike. Given the reported number of birdstrikes, this suggests that the ratio of birdstrikes to "birds seen" is very low at approximately 0.0006 strikes per sighting. There were no birdstrikes to RPT aircraft reported. While most pilots saw flocks of birds at or near the new airport site, fewer avoided flying over the new airport site because of previous or current bird activity. In fact most pilots took no avoiding action. Three pilots reported often avoiding the new site, but the validity of their response is questionable. It would seem that, in the opinion of the pilots surveyed, the bird strike risk at the new airport site is little different to the existing airport site.

The survey response on fog showed that there were some problems with fog at Broome, but these were less at the new airport site. The new airport site tends to clear earlier because the type of fog is a sea fog, which typically clears from the land side at Broome.

There was no evidence to suggest that bird strike risk will change substantially at the relocated airport. It is therefore recommended that the relocated airport put in place the same birdstrike management practices as the existing airport.

CONTENTS

1. INTRODUCTION

Broome International Airport serves the town of Broome, Broome Shire and the surrounding area in the Kimberley. The airport is being relocated to a new site at some 12 km east of the Broome townsite.

Preliminary comments received on the draft Public Environmental Review for the relocated airport included a question about the risk of birdstrikes at the new airport site. The question is whether the risk of birdstrike at the new airport site is significantly different to the existing airport.

2. RISK OF BIRDSTRIKE

There is a fairly small risk of birdstrike at the existing airport. Records at the existing airport show that in twelve months preceding this report, there were five strikes - four recorded bird strikes and one strike of a fruit bat. There were no reported bird strikes to RPT aircraft. The airport has in place appropriate bird hazard control measures in accordance with ICAO[1] recommendations.

Bird management is carried out on a day to day basis by means of regular checks, drainage and rubbish control, bird harassment, and participation in the Airservices Australia bird reporting programme. There is also a standing NOTAM[2] warning of possible bird hazards.

There may be an increased risk at the relocated airport due to contact with aircraft by migratory shore birds. To gather historical operational aviation experience on the matter, a survey was conducted of general aviation pilots flying in the Broome area. This process is in accordance with recommended ICAO practice.

3 SURVEY OF PILOTS

A survey was carried out of general aviation pilots at Broome over the period 8 February to 16 February 2000. It was a written survey, and an example of the survey form used is shown in Appendix 2.

The survey included pilots of single and twin engined aircraft, both piston and turboprop. It excluded pilots of jet aircraft RPT aircraft because they operate at greater heights and speeds, and are less able to see birds. To ensure their experience was not lost though, the formal bird strike reporting system at Broome was reviewed to ensure that bird strikes to RPT aircraft were including when drawing conclusions in this study.

[1] International Civil Aviation Organisation
[2] Notice to Airmen

There were 38 questionnaires issued, and 23 returned which is a 61% return, a good return for this type of survey. The survey captured a considerable amount of flying experience in the Broome MBZ, which is the mandatory broadcast zone – an imaginary circle of 30 nautical miles (approximately 54 kilometres) radius around Broome. Although the survey was divided equally between pilots of piston and turboprop aircraft, the pilots of turboprop aircraft had considerably more flying experience in the Broome MBZ as expected.

Table 1 Pilot experience

Main type of aircraft flown	Response
Piston (single or twin)	50%
Turboprop (single or twin)	50%
Piston engined flights	18%
Turboprop flights	82%
Total number of flights in Broome MBZ	15,550

4 RESPONSE ON BIRDS

For the number of flights made, there were negligible birdstrikes noticed (Table 2), although this might be a slight underestimation as it is possible for a pilot to have a birdstrike without being aware of it[3].

Table 2 Bird strikes

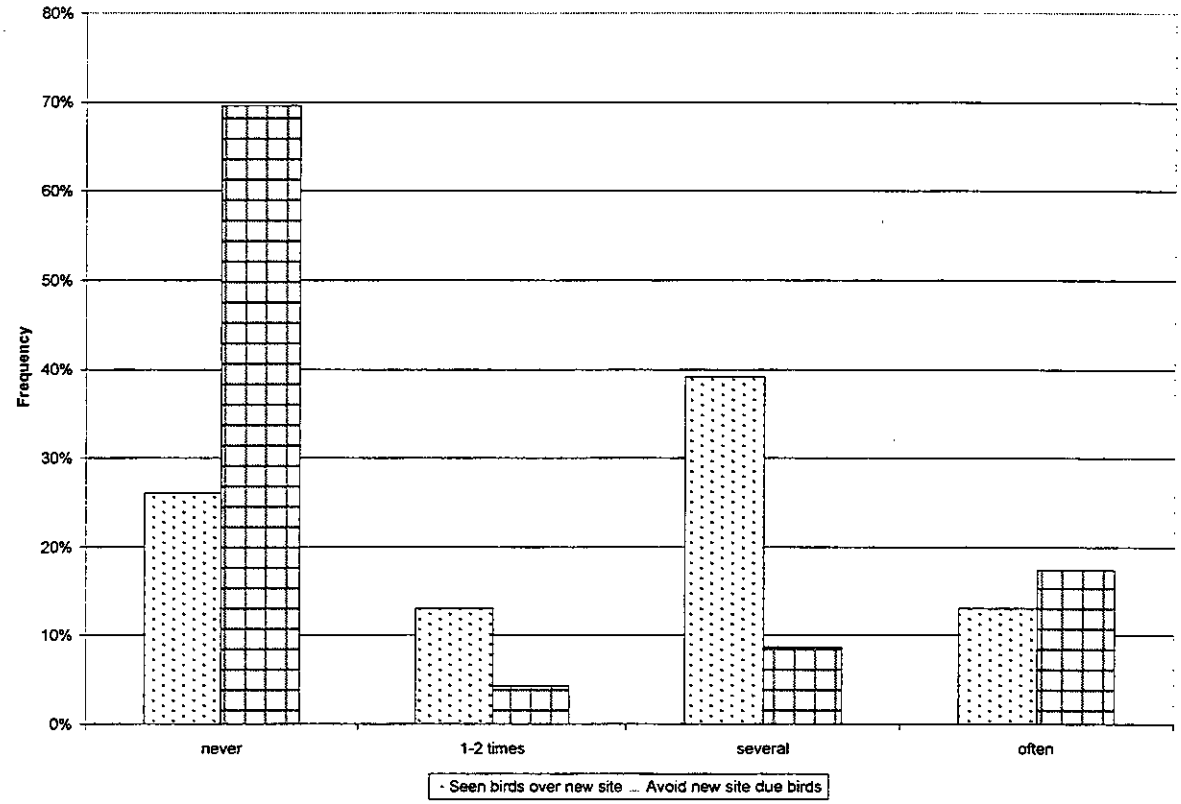
Flights without birdstrikes	15,549
Flights with birdstrikes	1

In response to the question about flocks of birds being seen near to or over the new airport site, the average response was that they had been seen between "1-2 times" and "several" times (Figure 1). While most pilots saw flocks of birds, fewer avoided flying over the new airport site because of previous or current bird activity. In fact most pilots took no avoiding action.

When the number of flights was taken into consideration through computation, this found that flocks of birds had been seen over or near to the new airport site on 10.4% of the flights. Given the reported number of birdstrikes, this suggests that the ratio of birdstrikes to "birds seen" is very low at approximately 0.0006 strikes per sighting. The one pilot that had experienced a birdstrike still flew over the new airport site despite bird activity; that pilot had also seen several flights of birds near to or over the new airport site (in some 1000 flights).

[3] Personal communication, Brent Hanson, Owner, Broome Aviation

Figure 1 Flocks of birds observed near the new site



However three pilots reported that they had often seen birds at the new airport site and that they often avoided the area due to bird activity. The same pilots also reported that they had often seen fog at the new airport site, and that they had experienced fog in the Broome MBZ either several times or often. All the responses were plotted in a scattergram to compare replies on "avoid flying over site because of bird activity" and "observed low level fog", and see if these three pilots were an isolated group (perhaps not wanting the airport to relocate to the new site) (Figure 2).

It appears that the experiences of these three pilots were isolated both in terms of fog and birds, and it raises a question about the overall validity of their response. However in the absence of other qualifying data, they were kept in the data set for the purposes of analysis.

5 RESPONSE ON FOG

The survey response on fog showed that there were some problems with fog at Broome, but these were less at the new airport site (Figure 3). Fog is a problem at Broome for only a week or two, twice a year - in May and August[4]. It is a sea fog, which rolls in from the sea and across the land. The new airport site tends to clear earlier because the fog tends to clear from the land side.

[4] Personal communication: Brent Hanson, Owner, Broome Aviation

Figure 2: Scattergram of responses on birds and fog

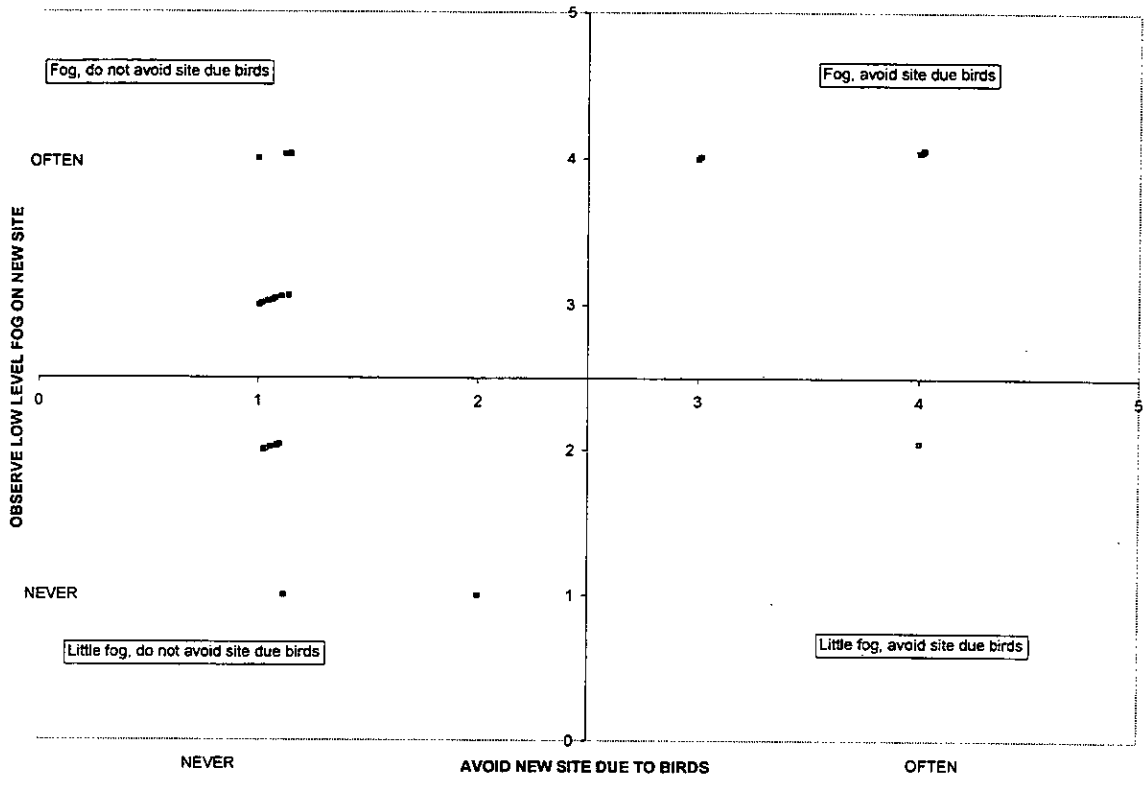
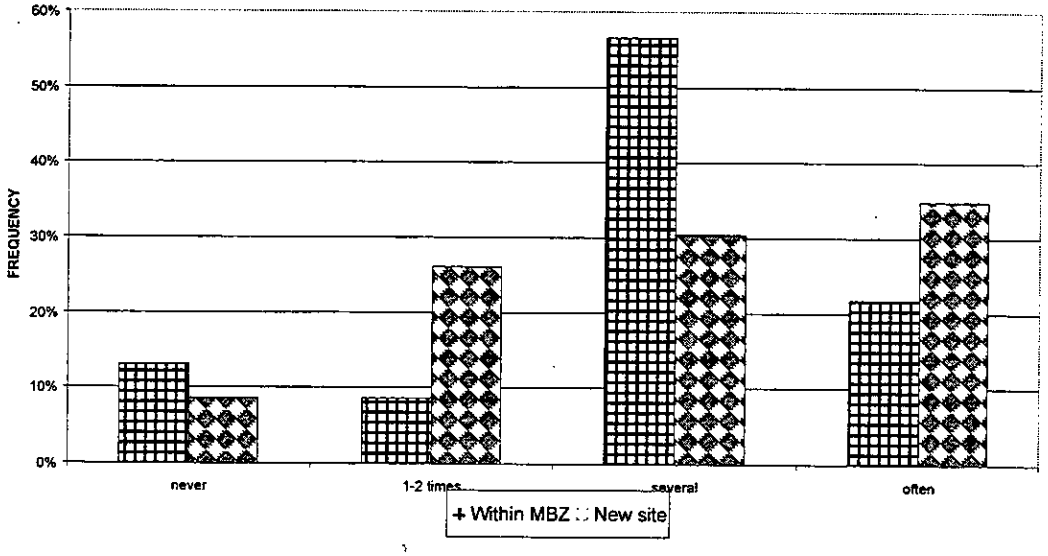


Figure 3 Occurrence of fog



APPENDIX A

GENERAL AVIATION PILOT SURVEY FOR PLANNING THE NEW AIRPORT

This survey is being run as part of the planning for the new Broome Airport. The new airport is to be located approximately 12 kilometres from the existing airport, SE of the OTC tower and just south of the Broome-Derby road.

Your flying experience in the Broome area is being sought to help us plan the new airport. We also have an automatic weather station located near the site gathering more data.

1 Estimate how many flights have you made in the Brome MBZ[5], and circle the closest number
10 50 100 500 1000 5000

2 What type(s) of plane do you mainly fly in the Broome MBZ?
single piston twin piston twin turboprop helicopter other

3 Have you ever experienced a bird strike in the Broome MBZ?
never 1-2 times several often

4 How often have you seen flocks of birds near to or over the new airport site?
never 1-2 times several often always

5 Do you ever avoid flying over the new airport site because of previous or current bird activity
never 1-2 times several often always

6 Have you ever experienced low level fog in the Broome MBZ?
never 1-2 times several often

7 How often have you seen low level fog near covering all or part of the new airport site?
never 1-2 times several often

[5] MBZ: mandatory broadcast zone - 30 nautical miles around Broome