APPENDIX A

Environment Australia's determination that the proposed Monkey Mia Resort expansion is not a controlled action

Environment Australia

Department of the Environment and Heritage

Mr Martin Bowman
Director
Bowman Bishaw Gorham
PO Box 465
SUBIACO WA 6008

Dear Mr Bowman

Monkey Mia Dolphin Resorts Pty Ltd/Tourism, recreation and conservation management/Monkey Mia/WA/Expansion of Monkey Mia Resort (EPBC Reference: 2003/1146)

Thank you for the above referral, received on 8 August 2003 and the additional information received on 26 September 2003, for decision whether or not approval is needed under Chapter 4 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The referral has now been considered under the EPBC Act and I have decided that the action is not a controlled action. Approval is therefore not needed under Part 9 of the Act before the action can proceed.

Please note that this decision only relates to the potential for significant impact on the specific matters of national environmental significance protected by the Commonwealth under the EPBC Act. There may be a need for separate State or Local Government environmental assessment and approval to address potential impacts on State, regional or local environmental values.

A copy of the document recording my decision is attached for your information. I have written separately to Mr Graeme Robertson of Monkey Mia Dolphin Resorts Pty Ltd to advise of my decision.

Yours sincerely

Wayne Fletcher
Acting Assistant Secretary
Policy and Compliance Branch

9 October 2003

RECEIVED
15 OCT 2003

AUSTRALIAN GOVERNMENT

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

DECISION THAT ACTION IS NOT A CONTROLLED ACTION

Pursuant to section 75 of the *Environment Protection and Biodiversity Conservation Act 1999*, I, WAYNE WILLIAM FLETCHER, Acting Assistant Secretary, Policy and Compliance Branch, Department of the Environment and Heritage, decide that the proposed action, set out in the Schedule, is not a controlled action.

SCHEDULE

The proposed action by Monkey Mia Dolphin Resorts Pty Ltd to expand the existing Monkey Mia Dolphin Resort area, including the waste water treatment plant, involving the removal of vegetation from approximately 8ha, located at Monkey Mia in the Shark Bay Area, near the township of Denham, WA, and as described in the referral and additional information received on 8 August 2003 and 26 September 2003 respectively under the Act (EPBC 2003/1146).

Dated this 9th day of October 2003

.....

ACTING ASSISTANT SECRETARY
POLICY AND COMPLIANCE BRANCH
DEPARTMENT OF THE ENVIRONMENT AND HERITAGE

APPENDIX B

Vegetation and Rare Flora Surveys
Report by Dr A Weston

VEGETATION AND RARE FLORA SURVEYS
CONCEPT DEVELOPMENT PLAN AREAS
MONKEY MIA DOLPHIN RESORT

SHIRE OF SHARK BAY

by

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(Ref. M01142)

8 February 2002

SUMMARY

This report describes methods and results of rare flora searches and vegetation surveys of two core study areas in the Concept Development Plan area, and of other relevant areas, in Monkey Mia Reserve, in a regional context. The two core study areas are:

- a proposed lease extension area adjoining the existing Monkey Mia Dolphin Resort and within which it is proposed to expand the resort ('resort extension study area': approximately 3 ha), and

- an area some 500 m south of the resort, surrounding the existing waste water treatment plant, and within part of which it is proposed to expand the plant ('WWTP extension study area': approximately 42 ha).

The principal objectives of this study are to describe vegetation types in the study areas, to search for rare flora there and to determine, in a regional context, the conservation value and reservation status of rare flora and vegetation types found during the field work.

The resort extension study area is on a white, almost flat coastal sandplain between the inland red sandplain and escarpment and the coastal dunes, which are near the southern and at the northern edges of the study area, respectively. The WWTP extension study area is south and west of the escarpment, on the red sandplain plateau.

The vegetation of the resort extension study area (or proposed lease extension area) is *Acacia sclerosperma* (Limestone Wattle, Silver-bark Wattle) Scrub, with some Thicket, Heath A and Low Scrub A, over *Scholtzia leptantha* (Coastal Myrtle) Dwarf Scrub C (to Low Heath C and Heath B) and *Rhagodia preissii* subsp. *obovata* Open Dwarf Scrub C over *Carpobrotus candidus* (White-flowered Pig Face) Very Open Herbs. The vegetation shows effects of drought and grazing. Severe disturbances (clearing) cover 30% to 50% of the part of the study area south of the existing resort area.

White coastal plains, and presumably vegetation similar to that in the resort extension study area, are also elsewhere on Peron Peninsula: at or near Dubaut Point, which is south of Monkey Mia, and at and near Cape Rose, other points north of Monkey Mia, Denham and other areas on the west coast.

The vegetation of the part of the waste water treatment plant extension area that has not been cleared is Thicket to Scrub dominated by *Acacia ramulosa* (Bowgada, Wanyu, Horse Mulga), often together with *Acacia tetragonophylla* (Curara). The densest vegetation is Bowgada Thicket, which adjoins the cleared area around the existing waster water ponds and merges into the other, more extensive vegetation type in the extension area, Bowgada-Curara Scrub. This vegetation also shows effects of drought and grazing, especially by goats. The effect of grazing is most evident in the eastern part of the study area.

The red sandplains Bowgada vegetation is well-represented on Peron Peninsula and on parts of the mainland to the east and southeast of the peninsula.

The conservation significance of the vegetation is currently more potential than actual. If feral animals, particularly goats and rabbits, can be eliminated from Peron Peninsula, and kept out, the peninsula will have Western Australia's largest area of protected Acacia shrublands. Overall, the peninsula's vegetation will have a very high conservation significance. The coastal plain vegetation may then have a higher significance for conservation than the red sandplain vegetation because there is so much less of it.

No Declared Rare or Priority Flora species was found in either study area, but six species of Priority Flora have been recorded within 3 km of the Monkey Mia study area. These species and their conservation codes are: *Acacia drepanophylla* P3, *Chthonocephalus oldfieldianus* P1, *Chthonocephalus tomentellus* P2, *Lepidium biplicatum* P2, *Olearia occidentissima* P2 and *Sondottia glabrata* P2. The *Acacia* was found east of the southeastern part of the waste water treatment plant extension area, but not in it.

None of the plants found in the study areas has a particular conservation significance.

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1.0 INTRODUCTION

This report describes methods and results of rare flora searches and vegetation surveys of two core study areas in the Concept Development Plan area, and of other relevant areas, in Monkey Mia Reserve, in a regional context. The two core study areas are:

- a proposed lease extension area adjoining the existing Monkey Mia Dolphin Resort and within which it is proposed to expand the resort ('resort extension study area': approximately 3 ha), and

- an area surrounding the existing waste water treatment plant and within part of which it is proposed to expand the plant ('WWTP extension study area': approximately 42 ha).

1.1 LOCATIONS

The resort extension study area is, essentially, the Expansion Area Stage I of O'Brien Planning Consultants (1995), which is 3.1 ha. Its latitude and longitude are approximately 25°48'00"S by 113°43'00"E.

The WWTP extension study area is a square around the existing waste water treatment plant. It includes areas already cleared of native vegetation, mainly the microwave relay tower site, the existing waste water treatment plant site, tracks to the tower and the plant, and areas around the tower and the plant. Approximate coordinates (AGD'66; 'wp' for 'waypoint') of the tower, the corners of the fence around the plant and the corners of the study area are:

• Microwave tower base	SW side ? (wp031)	25^48'02.5" S	113^42'48.4" E
• WWTP fence	NW corner (wp032)	25^48'05.5" S	113^42'48.2" E
	SW corner (wp033)	25^48'11.1" S	113^42'49.1" E
	SE corner (wp034)	25^48'10.0" S	113^42'51.1" E
	NE corner (inferred)	25^48'05.5" S	113^42'51.1" E
• WWTP ext. study area	NE corner	25^48'02.6" S	113^43'04.0" E
	SE corner	25^48'23.7" S	113^43'03.8" E
	SW corner	25^48'23.8" S	113^42'40.5" E
	NW corner	25^48'02.8" S	113^42'40.2" E

The location of Monkey Mia in relation to Denham is shown in Figure 1, and the locations of the study areas in relation to Monkey Mia are shown in Figure 2. Figure 1 uses Natmap Sheet 1646 Shark Bay (AGD'66) as a base, and Figure 2 uses Department of Land Administration 1990 aerial photography as a base. The coordinates used for site-plot locations in Figure 1 are from Claymore and Markey (1999, Appendix 1), and the coordinates use for Priority Flora locations are from the Department of Conservation and Land Management WAHERB database printouts refereed to in Appendix A.

1.2 OBJECTIVES

The principal objectives of this study are to describe vegetation types in the study areas, to search for rare flora there and to determine, in a regional context, the conservation value and reservation status of rare flora and vegetation types found during the field work.

1.3 REGIONAL CONTEXT

1.3.1 Climate

The climate of the Peron Peninsula is, according to the classification of climates by Bagnouls and Gaussen, "Hot Semi-desert Mediterranean" (Beard 1976a), with mean daily minimum and maximum temperatures in Denham ranging from 12.3^{o} and 21.5^{o} in July to 22.6^{o} and 31.9^{o} in February (Bureau of Meteorology: www.bom.gov.au/climate/averages/tables/cw_ 006044.shtml, 28/05/2001).

The mean annual rainfall in Denham is 228 mm (Bureau of Meteorology: www.bom.gov.au/ climate/averages/tables/cw_ 006044.shtml, 28/05/2001), 60% of which is between May and August. On average 1.3 mm falls in December and 7.6 mm in January. The rainfall for the 10-month period March-December 2001 was Seriously Deficient, i.e. in the lowest 10% of historic totals (Bureau of Meteorology: www.bom.gov.au/ climate/drought/drought.shtml). Monkey Mia is probably drier than Denham.

An ombrothermic diagram would probably show the dry season as normally extending from August to mid-April.

1.3.2 Land Systems

Spencer *et al.* (1987) show, at a scale of 1:250,000, the land systems of Monkey Mia Reserve and the rest of the eastern half or more of the part of Peron Peninsula north of 26 degrees as Sandplain (S1, in Acacia Sandplain Pasture Type), with enclaves of Birrida (Bx, in Samphire Pasture Type).

The Sandplain Land System is dark to dusky red sandy flat or gently undulating plains, often very extensive and rather uniform, with 4% occasional low longitudinal dunes up to 10 m high (Payne *et al.* 1987). Much of the vegetation is moderately close tall shrublands dominmated by *Acacia ramulosa*, which, after burning, loses dominance to *Gyrostemon ramulosus* and *Codonocarpus cotinifolius* in early years and, later, to variable seral shrublands with *Acacia sclerosperma, Ptilotus obovatus, Grevillea* spp. and/or other species.

The Sandplain Land System is extensive on the mainland east to southeast of Peron Peninsula.

The Birrida Land System is low-lying evaporite pans of gypsiferous sediments, with low shrublands of samphire and saltbush (Payne *et al.* 1987). According to Wheeler and Keighery (1997) there are herbfields in the gypsum-filled hollows known as birridas. This land system appears to be restricted to the Shark Bay peninsulas and some Shark Bay islands.

1.3.3 Landforms

Department of Conservation and Land Management (1993, p. 29) distinguishes four landform units and associated vegetation in Monkey Mia Reserve. These landform units are white coastal dunes, generally white coastal sandplain, red sandplain and saltpans (or birridas). Red

sandplain covers approximately 80% of the land area of the reserve. The coastal sandplain lies between the red sandplain and the narrow strip of coastal dunes. The eastern end of a Birrida Land System representation is in the central western part of the reserve, and Payne *et al.* (1987) Range Evaluation Site 640 is just east of it.

White coastal dunes are pronounced along the reserve's east coast south of the resort, then give way, south of the reserve, to pale red higher dunes which extend further inland. The white coastal dunes in the proposed extension area and west of it are barely distinguishable from the white coastal plain, which is widest just west of the resort and south of the Monkey Mia entrance booth and tapers to virtually nothing near the southeastern and northwestern corners of Monkey Mia Reserve. The part of the coastal plain southeast of the resort has pronounced depressions. The part west of the resort does not. Examination of small scale Landsat imagery of Peron Peninusula suggests that white coastal plains and dunes are also at or near Dubaut Point, south of Monkey Mia, Cape Rose and other points north of Monkey Mia and at Denham and other areas on the west coast.

Red sandplain covers most of Monkey Mia Reserve and the eastern part of the peninsula. It is separated from the coastal plain and dunes by an escarpment, which is rocky in some parts and loose sand slopes at the angle of repose in other parts.

1.3.4 Vegetation

Paczkowska and Chapman (2000; modified from Thackway and Cresswell 1995) show the Peron Peninsula as being in the southwestern parts of both the Eremaean Botanical Province and the Carnarvon Biogeographic Region (or Bioregion). It is just north of the northern end of the South-west Botanical Province and of the Geraldton Sandplains Biogeographic Region.

Beard (1976a, p. 25) notes that though "much of the vegetation [of the Shark Bay area] does not give clear-cut indications but has intermediate features", "on the Peron Peninsula where the mean annual rainfall is 250mm or less the vegetation is unequivocal." The two principal communities, the *Acacia ramulosa* scrub and the hummock grassland or shrub steppe, "can be unhesitatingly classed as Eremaean".

The Department of Conservation and Land Management (2000) very small scale (<1:1,000,000) vegetation map (Map 7) shows the vegetation of the north end and eastern half of Peron Peninsula and of extensive parts of the mainland east of it as being Eremaean Acacia shrublands (on clacareous loams).

The study area is in the Carnarvon Botanical District (and Region). According to Beard, at a scale of 1:250,000, it is in the Peron Peninsula Lharidon Vegetation System (Beard 1976a, p. 17) and, at a scale of 1:1,000,000, in the Peninsulas and Islands Vegetation System (Beard 1976b, pp. 91-92).

Descriptions and maps of vegetation that include the Peron Peninsula area prepared in the 1970s and 1980s were based primarily upon structure of the vegetation and dominant, generally tallest species in at least the tallest stratum. Beard (1976a, 1976b) and Payne *et al.* (1987) used this approach.

More recently, Claymore and Markey (1999) have been using a floristic community approach to describe and classify the vegetation of the Shark Bay area.

1.3.4.1 Plant associations

Beard's 1:250, 000 scale map shows the eastern half or more of Peron Peninsula north of 26 degrees as having *Acacia ramulosa* (bowgada) Scrub (a_9Si), with Samphire Succulent Steppe (K_3Ci) in all of the numerous mapped claypans which occur as enclaves in the scrub (Beard 1976a). Beard (1976a, 1976b) describes this vegetation as follows:

> *Acacia ramulosa* (bowgada) is dominant in the scrub and by much the most common species. It is a spreading shrub attaining 3m in sheltered positions, rather less under exposure. Associated species noted between Denham and Monkey Mia include:
>
> Large shrubs: *Acacia sclerosperma, A. tetragonophylla, Exocarpus sparteus, Eucalyptus ?oleosa* [*E. ?obtusiflora*][1] (mallee), *Grevillea eriostachya, Heterodendron oleifolium* [*Alectryon oleifolius*].
>
> Small shrubs: *Dodonaea inaequifolia, Eremophila platycalyx, E. oldfieldii, Labichea cassioides, Melaleuca* aff. *nesophila, Scholtzia umbellifera* [*S. leptantha*], *Triumfetta appendiculata.*
>
> Climbers: *Boerhavia chinensis* [*Commicarpus australis*], *Marsdenia australis, Stipa* [*Austrostipa*] *elegantissima.*
>
> Ephemeral: *Podolepis canescens.*
>
> At the south end of the peninsula . . . .
>
> The salt pans carry very scattered plants of *Arthrocnemum* [*Halosarcia*] spp. and *Frankenia pauciflora*, or are sometimes bare, with *Atriplex cinerea* around the margin.

Bowgada Scrub (a_9Si) covers extensive areas of sandplain in the Carnarvon Basin on the mainland east of the peninsula, and K_3Ci Samphire Succulent Steppe has a patchy distribution along the mainland coast east and north of the peninsula (Beard 1976b).

The Spencer *et al.* (1987) 1:250,000 scale map, which is of vegetation as well as of landforms, is the most recent original map of the vegetation of the peninsula available. It is very similar in outline to the Beard (1976a) map but is based upon more extensive, detailed field work and refers to land systems instead of associations. Payne *et al* (1987) describe the associations or communities (as "plant formations and major species") of each of the units that each land system comprises. They refer to approximately 70 species in their descriptions of the Sandplain Land System Unit 2 and the Birrida Land System Units 1 and 3.

1.3.4.2 Plant communities

The plant community approach is based upon the structure and species composition of dominant groups of species in each of the one or more strata of vegetation in a stand, or part of a stand (see, e.g., Trudgen 1996).

The Shark Bay Terrestrial Reserves Draft Management Plan 1998 (Department of Conservation and Land Management 1998, pp. 21-22) and Shark Bay Terrestrial Reserves Management Plan 2000-2009 (Department of Conservation and Land Management 2000,

[1] Newer names and identifications are added in brackets [ ].

p. 22) give 'High Priority' to their Recommendation (Action) Number 4: "Complete a detailed flora survey of the World Heritage Property, and determine and map plant community types".

The recommended studies have been begun (e.g. Claymore and Markey 1999) but not completed, and there is no available map of the plant communities (as distinct from formations and associations) of Monkey Mia Reserve or the rest of Peron Peninsula. However, Claymore and Markey (1999, pp. 48-58) do have descriptions of many plant community stands on Peron Peninsula. The locations of six of them are shown in Figure 1. Each of the six stands differs from the others; for instance, each has some dominant species that are not dominants in any of the other six.

The Monkey Mia Reserve Draft Management Plan (Department of Conservation and Land Management 1993) lists dominant species of four vegetation types in four landform units in the reserve. The Management Plan's description of the vegetation of the red sandplain unit is from the quotation from Beard (1976a) given above and, of the coastal sandplain and the coastal dunes, from Brooker (1988, pp. 101-102).

Brooker briefly describes the vegetation of all three landform elements in his 40 ha (approx.) study area immediately due south of the Monkey Mia caravan park, as follows:

> The vegetation on the coastal dune element was mainly *Acacia sclerosperma, Spinifex longifolius, Halosarcia* spp. and *Sporobolus virginicus*. The coastal sandplain was dominated by *Acacia sclerosperma, Scholtzia* spp. [*S. leptantha*], and *Rhagodia preissii.* This element included several small swamps vegetated by *Halosarcia* spp., *Frankenia pauciflora* and *Sporobolus virginicus*. The vegetation on the red sandplain was typical of most on northern Peron Peninsula with *Acacia ramulosa* dominating together with some *Acacia tetragonophylla* and *Heterodendrum oleifolium* [*Alectryon oleifolius*]. The red sandplain vegetation had a considerably higher species richness than the coastal sandplains on the margin of the peninsula.

The Management Plan notes that there is only one saltpan (birrida) in the reserve, near its western boundary, and that it contains saltbush, samphires (*Halosarcia* spp.) and sea heath (*Frankenia pauciflora*). This birrida is well west of the study area and is also distant from Brooker's study area.

Beard (1976a, 1976b), Spencer *et al.* (1987) and Payne *et al.* (1987) do not map or describe the vegetation of two of the landforms - the coastal sandplain and the coastal dunes - as distinct from that of the red sandplain.

1.3.4.3 Floristic communities

The floristic community approach is based upon total species occurrences in sampling sites, or releves, and floristic similarities between the sites. Gibson *et al.* (1994) used this approach in their survey of Floristic Community Types of the southern Swan Coastal Plain, and the Department of Conservation and Land Management is using it in its floristic survey of the Shark Bay World Heritage Area (Claymore and Markey 1999).

Of the 127 30m x 30m quadrats established in 1997 and 1998 to sample the Shark Bay vegetation, two – mmia01 and mmia02 - are in or very near the northern part of Monkey Mia Reserve, west of the resort extension study area, and four – pern01, pern02, pern03 and pern010 - are between 12 km and 17 km west to west northwest of Monkey Mia (see Figure 1). The lists of species recorded in the quadrats have not yet been analysed floristically.

1.3.5 Flora

1.3.5.1 Total flora

There are several lists of flora of the Shark Bay Region and parts of the region. Lists and descriptions that include the Peron Peninsula include Keighery (1990), Trudgen and Keighery (1995) and Claymore and Markey (1999). Keighery (1990) and Trudgen and Keighery (1995) list which species were recorded on Peron Peninsula. The Claymore and Markey species list does not distinguish between the peninsulas.

Keighery (1990) lists 673 vascular plant taxa for the Shark Bay area, while Trudgen and Keighery (1995) list 855 vascular plant taxa for the World Heritage Area and environs. The enumeration and listing in both articles are based largely upon records in the Western Australian Herbarium, augmented by literature searches and, at least in July 1988, some field collecting.

Claymore and Markey (1999) recorded 383 vascular plant taxa on Peron Peninsula, Edel Land and Bernier and Dorre Islands during three periods of field work, in September-October 1997, June-July 1998 and August-September 1998. Three hundred and seventy-three (373) of the taxa were recorded in one or more of 127 site-plots (quadrats) which are 30 m by 30 m, while ten were recorded only outside the plots. Three hundred and thirty-four (334) of the taxa were recorded on Peron Peninsula and Edel Land, where 90 site-plots were established.

Department of Conservation and Land Management (1998, 2000) reported that 279 flowering plant species have been recorded in Francois Peron National Park, which is 52528 ha and most of the part of Peron Peninsula north of the Denham – Monkey Mia road.

Fifty-one (51) taxa (species, subspecies and varieties) of vascular plants were recorded in the mmia02 and mmia01 site-plots 1 to 3 km west of the resort extension study area (see Figure 1), of which two species are established non-native aliens and 49 are native to the area. The plots are, respectively, in and near Monkey Mia Reserve.

1.3.5.2 Significant flora

Keighery (1990), Trudgen and Keighery (1995) and Claymore and Markey (1999) indicate which taxa they list are Declared Rare or Priority Flora, endemic, at their northern, southern and western limits of distribution, new records or otherwise significant or unusual. They also indicate which taxa are weeds.

The results of rare flora searches requested of the Department of Conservation and Land Management for the co-ordinates 25°30'-26°30' & 113°30'-114°00' (Faure Island and most of Peron Peninsula) and the location names Shark Bay, Hamelin, Denham, Nerren Nerren, Tamala and Peron Peninsula listed the 40 Declared Rare and Priority Flora species listed in Appendix A's Table A1. Six of the 40 species have been recorded within 3 km of the Monkey Mia study areas. These species and their conservation codes are:

- *Acacia drepanophylla* P3
- *Chthonocephalus oldfieldianus* P1
- *Chthonocephalus tomentellus* P2
- *Lepidium biplicatum* P2
- *Olearia occidentissima* P2
- *Sondottia glabrata* P2

The Priority Three species *Grevillea rogersoniana* may have been recorded approximately 6 km west and west southwest of the resort extension study area. However, none of the eleven collections in the Department of Conservation and Land Management WAHERB printouts is more recent than 1962 and few, if any, originally gave coordinates for collecting sites. It is unlikely that there is habitat for the species in Monkey Mia Reserve, as Mackinson (2000) states that *Grevillea rogersoniana* "Grows in tall woodland or *Banksia* scrub, on dunes in red calcareous sand."

Approximate locations where these seven species and eight other, more distant ones have been recorded are shown in Figure 1.

2.0 METHODS

The study comprises the following four stages:

- preparation for field work, including preparation of a table of rare flora to be searched for (Table A1 in Appendix A), familiarization with the appearance of the flora expected and examination of relevant reports, maps, aerial photographs and other information;
- field work to determine types, distribution and condition of vegetation units and rare flora habitats and presence of rare flora listed in Table A1 and of other significant flora;
- follow-up work, including identification of plant specimens collected during the field work, and
- preparation of a report.

These stages are described in Sections 2.1 to 2.3 below.

2.1 PRIOR TO FIELD WORK

The first phase of the project was preparation of a table of Declared Rare Flora and Priority Flora and other rare flora with distributions that may include Monkey Mia Reserve, and examination of relevant reports, maps, aerial photography and other information dealing with vegetation and other aspects of the study area.

Department of Conservation and Land Management printouts and other sources used in preparation of the table are described in Appendix A of this report. The table, Appendix A's Table A1, lists 40 species and subspecies, along with conservation codes, distributions, localities and flowering times. During preparation of the table, herbarium specimens in the Western Australian Herbarium of taxa (species, subspecies and varieties) listed in the table were examined for familiarization with their appearance, habitats, distribution and flowering times.

The relevant maps and reports examined are mainly those referred to above, in Section 1.

Aerial photography examined was 1:4,000 and smaller scale digital printouts of Department of Land Administration aerial photography flown in 1990. The aerial photography was provided by Bowman Bishaw Gorham.

2.2 FIELD WORK

Arthur Weston undertook vegetation surveys of the two study areas, and other areas, and searches for rare flora plants and likely habitats for them there on 24 to 26 January 2002. The surveys and searches were walked through and between the study areas, in the reserve's east coast area and nearby uplands, and to site-plot mmia02 and in and around it. Vegetation of some areas bordering the study areas and near them was also observed during the field work.

Dominant species and structure of the strata in stands of vegetation were described. For the sake of consistency with the studies by Claymore and Markey (1999), the Muir (1977) system of classification was used. The Keighery/Trudgen six point scale (Keighery 1994; Government of Australia 2000), similar to the five-point scale used by Claymore and Markey, was used for assessing condition. The classification and scale are reproduced in Appendix C.

The principal taxa searched for during the field work were the 40 taxa listed in Appendix A's Table A1, but other DRF and Priority Flora and otherwise significant flora were also objects of the searches.

Vegetation and habitats were photographed during the field work, and specimens were collected of plants not readily identifiable to species, subspecies or variety in the field.

2.3 AFTER FIELD WORK

Plant specimens collected in the field were identified by checking them against keys and descriptions in various floras and taxonomic works, consulting with other botanists and comparing with named specimens in the Western Australian Herbarium.

Then a list of species recorded in Monkey Mia Reserve, including the two study areas, was compiled and used as one basis for defining vegetation types.

3.0 RESULTS

3.1 VEGETATION

The vegetation of the proposed resort extension area and the waste water treatment plant extension area is described below. It is mapped on Figure 2, using the letter symbols **L**, **G**, **D**, **B** and **BC** to designate vegetation types, symbols which are bracketed in the following descriptions of the vegetation.

Views of the vegetation are shown in Plates 1 and 2.

3.1.1 Proposed Lease Extension Area, Monkey Mia Dolphin Resort

The vegetation of the part of the proposed lease extension area west of the existing resort is *Acacia sclerosperma* (Limestone Wattle, Silver-bark Wattle) Scrub, with some Thicket, Heath A and Low Scrub A, over *Scholtzia leptantha* (Coastal Myrtle) Dwarf Scrub C (to Low Heath C and Heath B) and *Rhagodia preissii* subsp. *obovata* Open Dwarf Scrub C over *Carpobrotus candidus* (White-flowered Pig Face) Very Open Herbs **(L)**, with a few plants of

Spinifex longifolius (Beach Spinifex) in the northern part, and, in a few places, a few plants, most of which appear to be dead or close to it, of *Gyrostemon ramulosus, Lechenaultia linarioides* and *Exocarpus aphyllus*. There are a *Nitraria billardierei* shrub a short distance west of the study area and a small grove of small trees of *Gyrostemon ramulosus* in a shallow depression in the study area's northeastern corner **(G)**. A few dry fragments of dead *Brassica tournefortii* plants are occasional on the ground.

Dune vegetation on the almost imperceptible dune crest intergrades with the northern part of the Limestone Wattle Scrub community. It is presumably outside the study area and is mainly *Acacia sclerosperma* (Limestone Wattle) Open Scrub (to Scrub) over *Scholtzia leptantha* (Coastal Myrtle) Dwarf Scrub C over *Spinifex longifolius* (Beach Spinifex) Open Low Grass. The foredune seaward slope is *Spinifex longifolius* Open Tall Grass over *Carpobotus candidus* (White-flowered Pig Face) Open Dwarf Scrub D, with *Sporobolus virginicus* growing in clumps of *Spinifex* and with *Threlkeldia diffusa*.

This vegetation is suffering from drought and some grazing, mainly of rabbits, but, otherwise, it appears to be in Very Good to Excellent condition.

The vegetation of the part of the proposed lease extension area south of the existing resort is similar to that of the west side, but patchy, with parts having been cleared **(D)**. The overall condition of the vegetation is assessed as Very Good to Degraded, with severe disturbances (clearing) covering 30% to 50% of the area.

The southern boundary of the resort has a row of tall, bushy Tamarisk trees, probably *Tamarix aphylla.* These trees are not apparent on the 1990 aerial photography that is the base for Figure 2.

3.1.2 Waste Water Treatment Plant Extension Area

The vegetation of the part of the waste water treatment plant extension area that has not been cleared is Thicket to Scrub dominated by *Acacia ramulosa* (Bowgada, Wanyu, Horse Mulga), often together with *Acacia tetragonophylla* (Curara). The densest vegetation is Bowgada Thicket **(B)**, which adjoins the cleared area around the existing waster water ponds and merges into the other, more extensive vegetation type in the extension area, Bowgada-Curara Scrub **(BC)**.

Bowgada Thicket is *Acacia ramulosa* shrubs around 3 m tall providing over 50% canopy cover (and slightly less PFC), with few and generally smaller shrubs of *Persoonia bowgada, Acacia tetragonophylla, Eremophila maitlandii, Rhagodia latifolia* and *Stylobasium spathulatum* shrubs. There is no sign of burning, at least for many years. The existing waste water treatment ponds were put into the middle of this stand.

Bowgada-Curara Scrub is *Acacia ramulosa – Acacia tetragonophylla* Scrub (> 2 m tall and in some places shorter) over *Rhagodia latifolia* Low Scrub A/B over *Ptilotus divaricatus – Ptilotus obovatus* Open Low Scrub B/C. In some places *Acacia sclerosperma* shares dominance, but it is often absent. Common associated species of shrubs and vines are *Grevillea eriostachya, Exocarpus aphyllus, Scaevola spinescens, Scaevola tomentosa, Rhagodia preissii* subsp. *obovata, Solanum orbiculatum, Commicarpus australis, Lechenaultia linarioides, Marsdenia australis* and *Porana sericea. Alectryon oleifolius, Persoonia bowgada, Eremophila maitlandii* and *Stylobasium spathulatum* are less common or localised. Additional species are listed in the 'TP Ext' column in Table B1. Due to the continuing drought and the grazing of feral mammals, there were few herbaceous plants and grasses and none of the ones found were in flower, or even alive.

These two plant communities (and variations of them) apparently cover most of Monkey Mia Reserve, but none of the resort extension study area. The Bowgada-Curara Scrub **(BC)** is probably a seral stage of Bowgada Thicket **(B)**, the 'variable seral shrubland' of Payne *et al.* (1987) referred to in Section 1.3.2 above.

The condition of the vegetation of the waste water treatment plant extension area is assessed as Very Good (to Excellent). The vegetation is suffering from drought and some browsing and grazing, especially by feral goats. Goats were seen at the pond near the walk trail and hide during the field work, and goat tracks and signs of browsing were abundant, particularly in the eastern part of the extension study area south of the pond.

3.2 FLORA

The seventy-three (73) species of vascular plants recorded in or very near Monkey Mia Reserve are listed in Appendix B's Table B1. The table includes all taxa recorded in and near the two study areas, in Site-plots mmia01 and mmia02 and on the Eastern Bluff sandplains and dunes. The 46 species identified and recorded by Arthur Weston are indicated in the fourth column with an 'X'. Identifications not confirmed by him as being in the reserve are indicated with a question mark (?). It is likely that most, if not all, of the 27 question mark species do also occur in the reserve. Fourteen of the 27 are grasses and herbaceous plants, most of which, due to drought and grazing, were not recorded during the January 2002 surveys.

3.2.1 Rare Species

No Declared Rare or Priority Flora species was found in either study area, and Department of Conservation and Land Management (1993, p. 29) states that "there are no declared rare flora on the Reserve, nor species on CALM's priority flora list" then, in 1993. However, according to recent Department of Conservation and Land Management priority flora databases search results and species list for Site-plot mmia01, the following five species of Priority Flora have been recorded in, or very near, the reserve. Their Priority (P) codes are listed with them, and their significance symbols are given in brackets.

- *Acacia drepanophylla* P3 (ASW: e?)
- *Chthonocephalus oldfieldianus* P1 (n, new for the WHA, not listed by TK or CM)
- *Lepidium biplicatum* P2 (ASW: n?)
- *Olearia occidentissima* P2 (TK, CM: e)
- *Sondottia glabrata* P2 (TK, CM: e)

Acacia drepanophylla and *Olearia occidentissima* were recorded in Site-plot mmia01, which is approximately 3 km west of the Monkey Mia jetty. Several plants of *Acacia drepanophylla* were also found, during the January 2002 field work, in Monkey Mia Reserve in Bowgada-Curara Scrub a few metres or so east of thesoutheastern part of the WWTP extension study area, at (AGD'66) 25^48'23.7" S 113^43'03.8" E. The species may also be represented in the southeastern part of the study area, but no plants of it were found there or within sight of there during the field work. A photograph of *Acacia drepanophylla* is reproduced in Plate 3.

Probably no Priority species, nor habitat for any, is in the resort extension study area, but the *Olearia* might be near, if not in, the WWTP extension study area. Although shallow soils over limestone are the principal habitats of the species, Claymore and Markey report that *Olearia occidentissima* has a widespread distribution over Peron Peninsula.

Because the principal habitats of *Chthonocephalus oldfieldianus*, *Lepidium biplicatum* and *Sondottia glabrata* are clayey soils, it is unlikely that any of these three species occurs in either of the study areas. However, if any does occur there, it is unlikely that it would have been found during the January 2002 field work, as two of the species being annual herbaceous plants and the third, the *Lepidium*, a short-lived shrub, all three would be likely to be absent or not identifiable during the drought conditions obtaining at the time.

3.2.2 Other Significant Flora

Seven of the non-priority taxa listed in Table B1 that might, according to Trudgen and Keighery (1995: TK) or Claymore and Markey (1999: CM), be considered significant in the World Heritage Area (and symbols for their reasons for being considered significant: 'e' – endemic to World Heritage Area; 'n' – northern limit of range and 's' – southern limit of range) are:

- *Acacia sclerosperma* subsp. *sclerosperma* (TK: n)
- *Anthobolus foveolatus* (TK, CM: n)
- *Brachyscome latisquamea* (TK: s)
- *Crassula colorata* var. *colorata* (CM: n
- *Eemophea aggregata* (TK: e?)
- *Marsdenia graniticola* (TK, CM: n
- *Persoonia bowgada* (TK: n)

The *Acacia, Anthobolus, Brachyscome* and *Persoonia* were all common, at least locally, in the WWTP extension study area, and the *Acacia* was the dominant tall shrub in the resort extension study area.

The preferred habitats of the *Eremophea* and the *Marsdenia* are not in the study areas, but the *Crassula*, a small annual herbaceous plant, would probably be found there during a favourable season.

3.2.3 Weeds

The two species of weeds recorded in site-plots mmia01 and mmia02 are *Brassica tournefortii* and *Cenchrus ciliaris.* A few scraps of long-dead *Brassica tournefortii* plants were found in both extension study areas.

4.0 DISCUSSION

4.1 REGIONAL REPRESENTATION

The descriptions and mapping of vegetation by Beard (1976a, 1976b), Payne *et al.* (1987) and Spencer *et al.* (1987) suggest that the *Acacia ramulosa* and *Acacia tetragonophylla* associations of the WWTP extension study area, or variations of them richer in species, are well-represented on Peron Peninsula and on parts of the mainland to the east and southeast of the peninsula.

Because Beard (1976a, 1976b), Payne *et al.* (1987) and Spencer *et al.* (1987) do not map or describe the coastal vegetation of the resort extension study area, it is impossible to describe its regional representation. However, examination of small scale Landsat imagery of Peron

Peninusula and reference to site-plot descriptions suggest that white coastal plains, and presumably similar vegetation, are also at or near Dubaut Point, which is south of Monkey Mia, and at and near Cape Rose, other points north of Monkey Mia, Denham and other areas on the west coast.

Three taxa of plants found in the study areas - *Acacia sclerosperma* subsp. *sclerosperma*, *Anthobolus foveolatus* and *Persoonia bowgada* - are, in the World Heritage Area, reported to be at the northern limit of their ranges of distribution, and one, *Brachyscome latisquamea*, at its southern limit (Trudgen and Keighery 1995, Claymore and Markey 1999). All are in the WWTP extension study area, and one, the *Acacia*, is in the resort extension study area.

4.2 CONSERVATION SIGNIFICANCE

None of the vegetation units in the study area is endorsed as threatened (Listing printout 2002) or was nominated as threatened (English and Blyth 1997).

The conservation significance of the vegetation is currently more potential than actual. If feral animals, particularly goats and rabbits, can be eliminated from Peron Peninsula, and kept out, the peninsula will have Western Australia's largest area of protected Acacia shrublands. Overall, the peninsula's vegetation will have a very high conservation significance. The coastal plain vegetation may then have a higher significance for conservation than the red sandplain vegetation because there is so much less of it.

None of the plants found in the study areas has any particular conservation significance.

4.3 LIMITATIONS OF THE STUDY

The effects of the current drought on the vegetation – paucity of flowering, loss of leaves, death - makes identification of plants difficult or impossible, especially of grasses and other herbaceous plants.

Because published, and otherwise available, local and regional mapping and detailed description of the coastal plains vegetation represented in the resort extension study area is lacking, assessments of regional representation and conservation significance can be no more than speculative. And photographs and site-visits at a number of locations in Acacia shrublands elsewhere on Peron Peninsula on the mainland east of it would be necessary to confirm the tentative assessments about regional representation and conservation significance of waste water treatment plant study area Bowgada shrublands made on the basis of comparisons with published maps and descriptions.

Although very few species of plants were in flower at the time of the survey, an attempt was made to compile a comprehensive list of species. Many species could be added to the list, perhaps even doubling the number of species in it, if field work were undertaken during periods of flowering. The resulting list might include additional Priority Flora and other significant species, but no Declared Rare Flora species.

5.0 ACKNOWLEDGEMENTS

Access to the Western Australian Herbarium collections was essential for carrying out the project and is greatly appreciated. Paul Wilson's help with plant identifications, Mike Lyon's and Sally Black's provision of the 1999 Shark Bay report and species lists for site-plots, assistance by Department of Environmental Protection librarians and drafting by Simon Crofts, of Bowman Bishaw Gorham, are also greatly appreciated.

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LEGEND

- Location of site-plots for floristic survey
- Approximate location of priority flora species
- Location of site-plots with priority flora species

N

0 1 3 5km

Scale 1:100000

Source: NATMAP

Figure 1

Location of Monkey Mia, Site-plots and Priority Flora

BOWMAN BISHAW GORHAM

ENVIRONMENTAL MANAGEMENT CONSULTANTS

LEGEND

- Vegetation Boundary
- B Bowgada Thicket
- Bc Bowgada - Curara Scrub
- L Limestone Wattle Scrub
- G *Gyrostemon ramulosus* small trees
- D Degraded: cleared of vegetation

N

0 50 150 250m

Scale 1:5000

Figure 2

Monkey Mia Study
Areas and their Vegetation

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

PLATE 1 *Acacia sclerosperma* (Limestone Wattle) Scrub, with some Thicket, Heath A and Low Scrub A, over *Scholtzia leptantha* (Coastal Myrtle) Dwarf Scrub C (to Low Heath C and Heath B) and *Rhagodia preissii* subsp. *obovata* Open Dwarf Scrub C over *Carpobrotus candidus* (White-flowered Pig Face) Very Open Herbs, in western and southwestern parts of Monkey Mia Dolphin Resort proposed lease extension area. Between Denham – Monkey Mia road and Red Cliff Bay. Looking north. *Acacia sclerosperma* in foreground. Caravan park in central eastern part of photograph. (Photographs ASW 02.I.2-22, 6)

A. Looking westwards over southern part of WWTP extension area.
Mainly Bowgada-Curara Scrub. Goat tracks in foreground.

B. Looking eastwards from WWTP. Bowgada-Curara Scrub in background to base of (red) sand dunes.
Bowgada Thicket: standing in mid-ground, rolled and largely cleared in foreground.

PLATE 2 Bowgada (*Acacia ramulosa*) Thicket and Bowgada-Curara (*Acacia ramulosa - Acacia tetragonophylla*) Scrub of the Monkey Mia waste water treatment plant (WWTP) extension area.
(Photographs A: ASW 02.I.3-1A and B: ASW 02.I.2-11)

A. *Gyrostemon ramulosus* small trees, with *Acacia sclerosperma* and *Scholtzia leptantha*, in NE corner of western part of Monkey Mia Dolphin Resort proposed lease extension area. (Photograph ASW 02.I.2-24)

B. *Acacia drepanophylla* (P3) shrub a few metres or so east of the southeastern part of the WWTP extension study area. Looking southeast. (Photograph ASW 02.I.2-19)

PLATE 3 *Gyrostemon ramulosus* small trees, and *Acacia drepanophylla* (P3) shrub.

APPENDIX A

Peron Peninsula Rare Flora

Contents

APPENDIX A

Peron Peninsula Rare Flora
Declared Rare and Priority Flora Recorded in the Shark Bay Area,
Particularly Peron Peninsula and Faure Island

(based basically upon CALM rare flora database printouts of October 2001)

Introduction

Table A1 lists 40 taxa (species, subspecies and varieties) of Declared Rare and Priority Flora recorded in the Shark Bay World Heritage Area, mainly on Peron Peninsula, along with information about their conservation codes, distributions, localities where they have been recorded and flowering times. The information about distributions, localities and flowering times is not always comprehensive.

The Table A1 list was compiled by CALM staff from searches of three CALM databases. The cover letter with the printouts from two sets of the database search results emphasizes that "the information supplied should be regarded as an indication only of rare flora that may be present". There may well be rare, or otherwise significant, flora in the area other than the taxa listed in the printouts.

The three CALM databases, the search parameters and the dates the searches were done are:

- the current, 23 August 2001, *Priority Species List* database for the locations Denham, Hamelin (Pool), Nerren Neren (Station), Peron Peninsula, Shark Bay and Tamala (25 October 2001),

- the *Threatened (Declared Rare) Flora* database for records in the rectangle defined by the coordinates 25°30'-26°30' & 113°30'-114°00' (25 October 2001), and

- the *Western Australian Herbarium Specimen* (WAHERB) database for records in the rectangle defined by the coordinates 25°30'-26°30' & 113°30'-114°00' (25 October 2001).

The rectangle defined by the coordinates contains Faure Island and most of Peron Peninsula.

The search results provided taxon names (Species, listed alphabetically), plus Priority Codes (Pr code), CALM Regions and Districts in which recorded, and Distributions for each of 40 taxa. It also provided flowering times (Flowering periods) for some of them and family numbers for all of them. This information is reproduced in the first, second, fifth, sixth, seventh, eighth and tenth columns, respectively, in Table A1. The bracketed flowering periods are from Paczkowska and Chapman (2000), mainly, and other sources.

The third column (DR&PFL) and fourth column (WAHERB) in Table A1 indicate which of two sets of database results listed each species. There were no results from the search of the Threatened Flora Database.

The ninth column, 'Comments', gives synonyms and information about the plants and their habitats. The information given in the WAHERB printouts for some of the taxa is at least indicative and should be useful in assessing how likely rare flora is to occur at particular locations in the study areas, if at all. Additional information about taxa listed in the table was obtained from examination of herbarium specimens and their labels in the Western Australian Herbarium, consultations with other botanists and information in Atkins (2001), Paczkowska and Chapman (2000) and Brown *et al.* (1998). These references are listed in the report to which this is Appendix A. Other sources are relevant volumes of *Flora of Australia* and *How to Know Western Australian Wildflowers*.

A number of the taxa listed in the table have been recorded only in habitats not represented in the survey areas.

According to the Department of Conservation and Land Management rare flora databases search results and the species lists for Site-plots mmia01 and mmia02 of Claymore and Markey (1999), the following five species of Priority Flora have been recorded in, or very near, the reserve (but outside the study areas):

- *Acacia drepanophylla* P3
- *Chthonocephalus oldfieldianus* P1
- *Lepidium biplicatum* P2
- *Olearia occidentissima* P2
- *Sondottia glabrata* P2

The *Acacia* and the *Olearia* were recorded in Site-plot mmia01, which is approximately 3 km west of the Monkey Mia jetty. Several plants of *Acacia drepanophylla* were also found, during the January 2002 field work, a few metres or so southeast of the WWTP extension study area. The species may also be represented in the southeast part of the study area, but none were found there or within sight of there during the field work.

The Priority Three species *Grevillea rogersoniana* may have been recorded approximately 6 km west and west-southwest of the resort extension study area. However, none of the eleven collections in the Department of Conservation and Land Management WAHERB printouts is more recent than 1962 and few, if any, of the original labels for these collections gave coordinates for collecting sites. It is unlikely that there is habitat for the species in Monkey Mia Reserve, as Mackinson (2000) states that *Grevillea rogersoniana* "Grows in tall woodland or *Banksia* scrub, on dunes in red calcareous sand."

Table A1
Declared Rare and Priority Flora Recorded in the Shark Bay Area, particularly Peron Peninsula and Faure Island

Species	Pr code	DR& PFL	WA HERB	Calm Regions	Districts	Distribution	Fl period	Comments	Fam no
Abutilon sp. Hamelin (AM Ashby 2196)	2	x	1	MW	Ca	Shark Bay, Hamelin Pool, Yaringa Stn	Jul-Sep	Shrub to 0.5 m (- 1 m) high; fls yl, orange, brown. Sand, loam, brown sandy clay, limestone rises.	221
Acacia drepanophylla	3	x	2	MW	Ca	Overlander, Coburn Stn, Hamelin, Yaringa	(Jun-Jul, Feb)	Tree (?) to 5 m; phyllodes falcate, spreading, many-nerved; racemes subsessile, 2-hded. Shallow soils.	163
Acanthocarpus parviflorus	3	x	1	MW	Ge	Kalbarri N.P., Shark Bay	May-Jun	Rhizomatous, tufted perennial herb; lvs narrow, spreading. Sand over limestone or sandstone.	054C
Angianthus microcephalus	2	x	0	MW	Ca,Ge	Cue, Dirk Hartog Island, Shark Bay, Hamelin Pool	Oct (Sep-Dec)	Small annual, to 0.1 m high. Sandy or clayey soils, salt swamps and pans.	345
Anthocercis intricata	3	x	1	MW	Ge,Ca	Dongara, Port Gregory, Denham, Kalbarri	Jun-Sep	Dense, spiny shrub to 3 m; fls white, cream, purple. Sand or loam over limestone, consolidated dunes.	315
Brachyscome halophila	3	x	1	MW,GLD	Ca,Ge, Kg	Pindar, Shark Bay, Lake Barlee, Tallering Stn	Sep (Aug-Oct)	Annual, to 0.3 m high; fls white, blue, purple. Calcareous sand, loam and on or near saline soils.	345
Chamelaucium conostigmum ms	3	x	0	MW,WB	Mo,Me, Ca	Coorow, Moore River, Winchester, Hamelin Pool	(Sep-Nov)	Shrub to 0.7 m high; fls dark red, purple. White or yellow sand, sandy clay, salt flats.	273
Chthonocephalus muellerianus	2	x	1	MW	Ca	Shark Bay, Billabong Roadhouse	(Sep)	Very small annual, to 0.07 m high. Red sand.	345
Chthonocephalus oldfieldianus	1	o	1	MW	Ca	Meadow Station	(Aug-Oct)	Very small stemless annual; fls white, green. Grey birrida and clayey soils; red sand (?).	345
Chthonocephalus spathulatus	1	x	0	MW	Ca	Boologooro, Wooramel Roadhouse, Hamelin Pool	(Aug)	Small annual; fls yellow. Red-brown loam or sandy clay; undulating plains.	345
Chthonocephalus tomentellus	2	x	6	MW	Ca	Shark Bay, Denham	Aug-Sep (Aug-Nov)	Small prostrate annual; fls yl. Undulating red sand-plains & dunes near saline depressions, clayey sand.	345
Dicrastylis micrantha	3	x	0	MW	Ge	Useless Loop, Kalbarri, Nerren Nerren Station	Aug-Dec	Spreading shrub to 1 m high; fls white. Red sand, sandplains.	313
Eremophila cuneata ms	1	x	0	MW	Ca	Shark Bay	?	=Myoporum cuneata. Shrub; foliage dense; lvs small, cuneate. Below limestone outcrop.	326
Eremophila splendens ms	1	x	0	MW	Ca	Shark Bay	(Sep)	Shrub; foliage dense; lvs sm, +/- obovate. Creamy brown calcareous sand, slopes, lowland plains.	326

Eucalyptus beardiana	R	x	0	MW	Ge,Ca	South of Shark Bay, Kalbarri NP	May, Aug-Sep	Tree to 5 m tall, multi-stemmed; bark smooth; infls pendulous. Red or yl sand ridges w. eucalypts.	273
Grevillea rogersoniana	3	x	11	MW	Ca,Ge	Shark Bay, Hamelin Pool, Denham, Nanga, Kalbarri	Aug-Nov	Shrub to 4 (-8) m high; lvs (sub-)spathul., often 3-toothed; fls red. Deep red calcareous sand on dunes.	090
Grevillea stenomera	2	x	0	MW	Ge	Kalbarri, Tamala	Jun-Oct (May-Dec)	Rounded silvery to blue-grey shrub to 2m; lvs pinnatisect, secund, pliable; fls orange, red, pink. Wh, yl or red sand over limestone or lateritic gravel.	090
Jacksonia dendrospinosa ms	4	x	0	MW	Ca	Nerren Nerren Station, Tamala	Nov	=Jacksonia sp. Nerren Nerren (RJ Cranfield 2576) [sp.37]. Erect shrub to 3.3 m; fls yl. Sandy clay.	165
Jacksonia velutina	4	x	1	MW	Ca,Ge, Mo	Kalbarri, Watheroo, E of Hamelin Pool	Aug-Sep, Nov	Erect, leafless, broomlike shrub to 1.5m; fls yl w reddish centre. Yl sand, sandplains and sandhills.	165
Lepidium biplicatum	2	x	1	MW	Ca	Carnarvon, Shark Bay	Sep	Erect shrub < 0.5 m tall; stem papillose; lvs entire, narrow; petals < 4 mm, white; fruit ovate. Clay?	138
Lepidobolus densus ms	3	x	0	MW	Mo,Ge, Ca	Coorow, Dirk Hartog Is., Shark Bay, Kalbarri NP	Oct	=Lepidobolus sp.(B Briggs 7770). Sedge-like, rhizomatous, caespitose perennial to 0.4 m. Yellow lateritic sand, lateritic gravel.	039
Macarthuria intricata	3	x	0	MW	Ca,Ge	Shark Bay, Kalbarri	(Sep-Dec)	Intricately branched shrub to 1 m high by 3 m. Red or black soil over limestone; grey sand or sand clay.	110A
Melaleuca huegelii subsp. pristicensis	2	x	0	MW	Ca	Shark Bay, Dirk Hartog Island, Tamala	Sep-Oct	=M. pristicensis. Shrub or tree to 2 m; fls pink, purple. Sand.	273
Olearia occidentissima	2	o	1	MW	Ca	Dirk Hartog Island	Sep (Jul-Sep)	Shrub to 0.2 m high; stem white; hds lrge, term.; fls white, pink. Mainly shallow soils over limestone.	345
Physopsis chrysophylla	3	x	2	MW	Ca,Ge	Eurardy Stn, Shark Bay, Kalbarri	Oct-Jan (Sep-Jan)	=Newcastelia chrysophylla. Erect shrub to 5 m; lvs thick, yl beneath; fls balls, yl. Red or yl sandy soils.	313
Pityrodia glutinosa	3	x	0	MW	Ca	Shark Bay, Hamelin Pool	Aug-Nov	=Pityrodia glabra. Spreading viscid shrub to 1.2 m high; fls wh. Red or orange sand, mallee woodland.	313
Ptilotus stirlingii var. pumilus	1	x	0	MW	Ca	Shark Bay, Tamala Stn	(Nov)	=Ptilotus stirlingensis var. pumilus. Procumbent or ascending perennial herb; fls red, white. Sandy clay.	106
Rhodanthe oppositifolia subsp. ornata	2	x	0	MW	Ca	Tamala, Shark Bay, Overlander	Jul-Aug	=Helipterum sp., Rhodanthe oppositifolium ms. Erect annual < 0.5 m high. Stony or clayey soils.	345
Scaevola chrysopogon	2	x	0	MW	Ca	Shark Bay, Nerren Nerren	Aug-Oct	Perennial, broom- or stick-like, +/- leafless herb or shrub to 0.6 m high; fls wh, crm. Red-brown sand.	341
Scaevola paludosa	2	x	0	MW,SC, SW	Es,Pe, Ca	Recherche Archipelago, Moore River, Shark Bay	Sep-Oct (Sep-Dec)	Erect or prostrate perennial herb or shrub to 0.5 m high; fls white. Sandy soils.	341

Scholtzia sp. Folly Hill (ME Trudgen 12097)	2	x	0	MW	Ge,Ca	Hamelin, Ajana, Cooloomia, Kalbarri	Oct (Aug-Oct)	Shrub to 1 m high; fls pink, white. Yellow or red sand, sand dunes.	273
Sclerolaena stylosa	1	x	0	MW	Ca	Shark Bay area	Aug	Rounded shrub ca. 0.5 m high; lvs slender, semiterete, 10-15 mm long, somewhat sigmoid, at least when young) with the apex recurved, densely tomentose. 103 mi SSE of Carnarvon.	105
Sondottia glabrata	2	x	2	MW	Ca	Peron Peninsula, Wooramel River, Edaggee	Sep (Sep-Oct)	Small annual; lvs narrow; heads narrow, axillary, cottony; fls white, yellow. Clayey soils & saline flats (& red sand).	345
Stenanthemum divaricatum	3	0	1	MW	Ca,Ge	Dirk Hartog Island, Quobba Stn, Dorre Is., Kalbarri	Aug-Sep (Jun-Sep)	=Spyridium divaricatum, no ms, ms. Small, dense, much and intricately branched, spinescent shrub; lvs obcordate, small, clustered; fls axillary in leaf clusters, in 2s or 3s, white. White or yellow sand over sandstone; with *Melaleuca cardiophylla*.	215
Tetragonia coronata	1	x	0	MW	Ca	Overlander Roadhouse, Hamelin Pool	Jun-Sep	=Tetragonia sp. Hamelin (M Trudgen 8000) [aff. cristata]. Decumbent annual; fls yellow. Red clay loam, calcrete outcrops.	110
Thryptomene sp. Carrarang (ME Trudgen 7420)	1	x	0	MW	Ca	Tamala, Shark Bay, Carrarang	?	Shrub to 3 m high. Calcareous sand, sand dunes.	273
Thryptomene sp. Steep Point (ME Trudgen 7421)	1	x	0	MW	Ca	Shark Bay, Dirk Hartog	Sep	Sprawling, prostrate shrub; fls pink. Calcareous sand, sand dunes.	273
Thryptomene sp. Tamala (ME Trudgen 7384)	1	x	0	MW	Ca	Womerangee Hill, Coburn, Tamala, Shark Bay	Apr,Aug	=Thryptomene strongylophylla subsp. Tamala (ME Trudgen 7384). Shrub to 1.2 m; fls pink. Red sand.	273
Triodia bromoides	4	x	0	MW	Ca,(Ge)	Shark Bay, (Murchison River), Kalbarri	(Jul-Oct)	=Plectrachne bromoides. "Spinifex" tussocks to 1.5 m high; glumes & lemmas long-awned; spikelet of loose, relatively few florets. Red, grey & calcareous sand, dunes, sandplains, stony rises.	031
Verticordia dichroma var. dichroma	3	o	1	MW	Ge	N of Kalbarri N.P. to N of Vermin Proof Fence	Oct (Oct-Dec)	Shrub to 3 m; branches rigid, straight; lvs opposite, small, sessile; fls in subterminal spikes, large, deep wine red with yellow centres. Yellow sand, sandplains.	273

APPENDIX B

Monkey Mia Flora

Contents

APPENDIX B

Monkey Mia Flora

Introduction

Table B1 lists 73 taxa (species, subspecies and varieties) of flora recorded within Monkey Mia Reserve and at one site less than 300 m west (outside) of the reserve's northwest corner. The list is based upon results of field work in the reserve in January 2002, upon species lists for Site-plots mmia01 and mmia02 of Claymore and Markey (1999) and upon WAHERB database printouts from the Department of Conservation and Land Management.

This is a preliminary, provisional working list. Many species could be added, perhaps even doubling the number of species in the list, if more field work were undertaken during periods of flowering, and, as was done, e.g., by Keighery *et al.* (1997), during consecutive periods of flowering in consecutive years. The resulting list might include additional Priority Flora and other significant species, but not any Declared Rare Flora species.

Table B1 is presented in three forms generated by the Western Australian Herbarium's Max database, Version 2.0.1.92. In Table B1a the taxa are arranged in alphabetical order, while in Tables B1b and B1c they are arranged in family order, in Table B1b by family name and in Table B1c by family code (i.e. systematically). The names of established aliens – weeds – are preceded by asterisks (*).

The first column gives taxon names and, in Tables B1b and B1c, family names (family code numbers are given in backets), and the second gives the plant growth form. The names used for taxa follow the Max 2.0.1.92 database, with synonyms being indicated in the Comments column. The growth form is indicated in Column 2 by the symbols:

- Gr (grass),
- He (herbaceous plant),
- Sh (shrub),
- Tr (tree),
- Vi (vine),

- S (small: < 1 m),
- M (medium: 1-2 m),
- T (tall: > 2 m),

- P (parasitic).

Symbols for Priority codes and other significance codes are given in the third column. These are:

- P1 (Priority One - Taxa which are known from one or a few (generally <5) populations, which are under threat),

- P2 (Priority Two - Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat, i.e. not currently endangered),

- P3 (Priority Three – Taxa which are known from several populations, and the taxa are not believed to be under immediate threat),

- e (endemic to, or almost endemic to, the Shark Bay World Heritage Area),
- n (at the northern end of the taxon's known range of distribution),
- s (at the southern end of the taxon's known range of distribution).

The fourth column uses the symbol 'x' to indicate the taxa recorded in Monkey Mia Reserve by botanist Dr. Arthur Weston during field work in January 2002. Question marks ('?') are used for taxa the occurrence of which in the reserve was not verified by Dr. Weston. The question mark taxa are listed on the basis of their being listed for the Claymore and Markey (1999) Site-plots mmia01 or mmia02 (indicated in the fifth column) or in the WAHERB database printouts provided by the Department of Conservation and Land Management as results of database searches for Priority Flora (see Appendix A).

The sixth and seventh columns indicate, with 'x', which taxa were recorded in the Monkey Mia Dolphin Resort extension area (Res Ext) and the waste water treatment plant extension area (TP Ext).

The last column, 'Comments', gives synonyms (=) and other information, mainly about ranges of distribution. Symbols and abbreviations used in the column which are not self-evident are:

- e (endemic),
- n (at the northern end of the taxon's known range of distribution),
- s (at the southern end of the taxon's known range of distribution).
- TK (Trudgen and Keighery 1995)
- CM (Claymore and Markey 1999)
- GJK (collected by GJ Keighery – 11509 – on 30 August 1989: common in area in Acacia low open shrubland on low dune, red sand)
- PGW (collected by PG Wilson on 29 September 1985, 2 km W of Monkey Mia on road to Denham, at edge of salt pan in clay)

Apparently, this is the first time *Chthonocephalus oldfieldianus* has been listed for the Shark Bay World Heritage Area or anywhere in it. This listing is based upon M. Lewis 37/92, collected on grey birrida near the old Monkey Mia tip on 3 October 1992.

None of the herbarium specimens referred to here was found in the Western Australian Herbarium collections.

	Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
	Acacia drepanophylla	Sh MT	P3, e?	x	mmia01	-	E of	e in Wannoo to Yaringa Stns
	Acacia ramulosa var. *ramulosa*	Sh MT		x	mmia01	-	x	
	Acacia sclerosperma subsp. *sclerosperma*	Sh MT	n	x	mmia02	x	x	TK: n of subsp is on Yaringa Stn
	Acacia synchronicia	Sh MT		?	mmia01	-	-	
	Acacia tetragonophylla	Sh MT		x	mmia01	-	x	
	Adriana tomentosa	Sh M		x	-	-	-	
	Alectryon oleifolius subsp. *oleifolius*	Sh MT		x	mmia01	-	x	
	Amyema preissii	Sh P		x	-	x	x	on Acacia sclerosperma & A. tetr.
	Angianthus cunninghamii	Sh S		x	-	-	-	
	Anthobolus foveolatus	Sh M	n	x	-	-	x	TK: n is in F Peron N P
	Austrostipa crinita	Gr		?	mmia01	-	-	
	Austrostipa elegantissima	Gr		?	mmia01	-	-	
	Avicennia marina	Tr VS		x	-	-	-	very few, young trees; < 0.5 m
	Brachychiton gregorii	Tr S		x	-	-	near	very few in Monkey Mia Reserve
	Brachyscome latisquamea	Vi/He	s	x	mmia01	-	x	Vi/He SM. TK: s is Tamala Stn
*	*Brassica tournefortii*	He		x	01, 02	x	x	
	Calocephalus francisii	He		x	mmia02	?	x	dead and very dry
	Carpobrotus candidus ms	He		x	-	x	-	flowers white
*	*Cenchrus ciliaris*	Gr		?	mmia01	-	-	
	Chenopodium gaudichaudianum	Sh M		?	mmia01	-	-	
	Chthonocephalus oldfieldianus	He	P1, n	?	-	-	-	nr old M Mia tip; new sp. for WHA
	Chthonocephalus tomentellus	He	P2	?	-	-	-	GJK: rd sand 3 km W of M Mia
	Commicarpus australis	Sh/Vi		x	mmia01	-	x	Sh/Vi M.
	Crassula colorata var. *colorata*	He S	n	?	mmia02	-	-	CM: n in WHA
	Dodonaea inaequifolia	Sh M		?	mmia01	-	-	
	Enchylaena tomentosa	Sh S		?	mmia01	-	-	
	Eragrostis dielsii	Gr		x	-	-	x	dead and very dry
	Eremophea aggregata	Sh S	e?	?	mmia01	-	-	TK: largely restricted to WHA
	Eremophila clarkei	Sh MT		?	mmia01	-	-	
	Eremophila maitlandii	Sh MT		x	-	-	x	
	Euphorbia drummondii	He		?	mmia01	-	-	
	Exocarpos aphyllus	Sh MT		x	01, 02	x	x	
	Frankenia pauciflora	Sh S		x	-	-	-	TK: type is from WHA
	Gnephosis arachnoidea	He		?	mmia01	-	-	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Grevillea eriostachya	Sh T		x	-	-	x	
Gyrostemon ramulosus	Tr S		x	-	x	-	
Halosarcia halocnemoides subsp. *tenuis*	Sh S		x	-	-	-	
Halosarcia indica subsp. *bidens*	Sh S		x	-	-	-	
Halosarcia pruinosa	Sh S		x	-	-	-	
Hibiscus sturtii var. *truncatus*	Sh S		?	mmia01	-	-	
Lechenaultia linarioides	Sh M		x	mmia02	x	x	TK: n in FPerNP; very distinct form
Lepidium biplicatum	Sh S	P2, n?	?	-	-	-	n in Yaringa Stn. PGW: 2km W MMia
Maireana tomentosa	Sh S		x	mmia01	-	x	
Marsdenia australis	Vi		x	-	-	x	= Leichardtia australis
Marsdenia graniticola	Sh S	n	?	mmia01	-	-	TK: Gymnea "granitica"; n in FPerNP
Nitraria billardierei	Sh M		x	mmia02	near	-	
Olearia occidentissima	Sh S	P2, e	?	mmia01	-	-	CM: e in WHA, widespread on P Pen
Persoonia bowgada	Sh M	n	x	-	-	x	TK:P sp(Crav.7112), n on Nanga Stn
Pimelea microcephala	Sh M		?	mmia01	-	?	
Podolepis canescens	He		?	mmia01	-	-	
Porana sericea	Vi		x	mmia01	-	x	
Ptilotus divaricatus var. *divaricatus*	Sh M		x	mmia01	-	x	
Ptilotus obovatus var. *obovatus*	Sh M		x	mmia01	-	x	
Ptilotus villosiflorus	He		?	mmia02	-	-	
Rhagodia latifolia subsp. *latifolia*	Sh M		x	mmia01	-	x	
Rhagodia preissii subsp. *obovata*	Sh SM		x	mmia02	x	x	
Rhodanthe condensata	He		?	mmia02	-	-	
Rhodanthe humboldtiana	He		?	mmia01	-	-	
Rhyncharrhena linearis	Vi		?	mmia01	-	-	
Salsola tragus	He		x	-	-	-	=Salsola kali
Santalum spicatum	Tr S		?	mmia01	-	-	TK: s of subsp nov; only on beach
Sarcocornia quinqueflora	Sh S		x	-	-	-	
Scaevola spinescens	Sh M		x	mmia01	-	x	
Scaevola tomentosa	Sh M		x	mmia01	-	x	
Scholtzia leptantha	Sh SM		x	mmia02	x	-	= S. umbellifera & Thryp. sp. in part
Sida calyxhymenia	Sh SM		?	mmia01	-	-	
Solanum lasiophyllum	Sh S		x	mmia01	-	x	
Solanum orbiculatum subsp. *orbiculatum*	Sh MS		x	01, 02	-	x	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Sondottia glabrata	He	P2, e	?	-	-	-	TK:e in WHA. PGW:clay 2kmW MMia
Spinifex longifolius	Gr		x	mmia02	x	-	
Sporobolus virginicus	Gr		x	-	x	-	
Stylobasium spathulatum	Sh M		x	01, 02	?	x	
Threlkeldia diffusa	Sh SM		x	mmia01	?	x	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Family: Aizoaceae (110)							
Carpobrotus candidus ms	He		x	-	x	-	flowers white
Family: Amaranthaceae (106)							
Ptilotus divaricatus var. *divaricatus*	Sh M		x	mmia01	-	x	
Ptilotus obovatus var. *obovatus*	Sh M		x	mmia01	-	x	
Ptilotus villosiflorus	He		?	mmia02	-	-	
Family: Asclepiadaceae (305)							
Marsdenia australis	Vi		x	-	-	x	= Leichardtia australis
Marsdenia graniticola	Sh S	n	?	mmia01	-	-	TK: Gymnea "granitica"; n in FPerNP
Rhyncharrhena linearis	Vi		?	mmia01	-	-	
Family: Asteraceae (345)							
Angianthus cunninghamii	Sh S		x	-	-	-	
Brachyscome latisquamea	Vi/He	s	x	mmia01	-	x	Vi/He SM. TK: s is Tamala Stn
Calocephalus francisii	He		x	mmia02	?	x	dead and very dry
Chthonocephalus oldfieldianus	He	P1, n	?	-	-	-	nr old M Mia tip; new sp. for WHA
Chthonocephalus tomentellus	He	P2	?	-	-	-	GJK: rd sand 3 km W of M Mia
Gnephosis arachnoidea	He		?	mmia01	-	-	
Olearia occidentissima	Sh S	P2, e	?	mmia01	-	-	CM: e in WHA, widespread on P Pen
Podolepis canescens	He		?	mmia01	-	-	
Rhodanthe condensata	He		?	mmia02	-	-	
Rhodanthe humboldtiana	He		?	mmia01	-	-	
Sondottia glabrata	He	P2, e	?	-	-	-	TK:e in WHA. PGW:clay 2kmW MMia
Family: Avicenniaceae (312)							
Avicennia marina	Tr VS		x	-	-	-	very few, young trees; < 0.5 m
Family: Brassicaceae (138)							
* *Brassica tournefortii*	He		x	01, 02	x	x	
Lepidium biplicatum	Sh S	P2, n?	?	-	-	-	n in Yaringa Stn. PGW: 2km W MMia
Family: Chenopodiaceae (105)							
Chenopodium gaudichaudianum	Sh M		?	mmia01	-	-	
Enchylaena tomentosa	Sh S		?	mmia01	-	-	
Eremophea aggregata	Sh S	e?	?	mmia01	-	-	TK: largely restricted to WHA
Halosarcia halocnemoides subsp. *tenuis*	Sh S		x	-	-	-	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Halosarcia indica subsp. *bidens*	Sh S		x	-	-	-	
Halosarcia pruinosa	Sh S		x	-	-	-	
Maireana tomentosa	Sh S		x	mmia01	-	x	
Rhagodia latifolia subsp. *latifolia*	Sh M		x	mmia01	-	x	
Rhagodia preissii subsp. *obovata*	Sh SM		x	mmia02	x	x	
Salsola tragus	He		x	-	-	-	=Salsola kali
Sarcocornia quinqueflora	Sh S		x	-	-	-	
Threlkeldia diffusa	Sh SM		x	mmia01	?	x	
Family: Convolvulaceae (307)							
Porana sericea	Vi		x	mmia01	-	x	
Family: Crassulaceae (149)							
Crassula colorata var. *colorata*	He S	n	?	mmia02	-	-	CM: n in WHA
Family: Euphorbiaceae (185)							
Adriana tomentosa	Sh M		x	-	-	-	
Euphorbia drummondii	He		?	mmia01	-	-	
Family: Frankeniaceae (236)							
Frankenia pauciflora	Sh S		x	-	-	-	TK: type is from WHA
Family: Goodeniaceae (341)							
Lechenaultia linarioides	Sh M		x	mmia02	x	x	TK: n in FPerNP; very distinct form
Scaevola spinescens	Sh M		x	mmia01	-	x	
Scaevola tomentosa	Sh M		x	mmia01	-	x	
Family: Gyrostemonaceae (108)							
Gyrostemon ramulosus	Tr S		x	-	x	-	
Family: Loranthaceae (097)							
Amyema preissii	Sh P		x	-	x	x	on Acacia sclerosperma & A. tetr.
Family: Malvaceae (221)							
Hibiscus sturtii var. *truncatus*	Sh S		?	mmia01	-	-	
Sida calyxhymenia	Sh SM		?	mmia01	-	-	
Family: Mimosaceae (163)							
Acacia drepanophylla	Sh MT	P3, e?	x	mmia01	-	E of	e in Wannoo to Yaringa Stns
Acacia ramulosa var. *ramulosa*	Sh MT		x	mmia01	-	x	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Acacia sclerosperma subsp. *sclerosperma*	Sh MT	n	x	mmia02	x	x	TK: n of subsp is on Yaringa Stn
Acacia synchronicia	Sh MT		?	mmia01	-	-	
Acacia tetragonophylla	Sh MT		x	mmia01	-	x	
Family: Myoporaceae (326)							
Eremophila clarkei	Sh MT		?	mmia01	-	-	
Eremophila maitlandii	Sh MT		x	-	-	x	
Family: Myrtaceae (273)							
Scholtzia leptantha	Sh SM		x	mmia02	x	-	= S. umbellifera & Thryp. sp. in part
Family: Nyctaginaceae (107)							
Commicarpus australis	Sh/Vi		x	mmia01	-	x	Sh/Vi M.
Family: Poaceae (031)							
Austrostipa crinita	Gr		?	mmia01	-	-	
Austrostipa elegantissima	Gr		?	mmia01	-	-	
* *Cenchrus ciliaris*	Gr		?	mmia01	-	-	
Eragrostis dielsii	Gr		x	-	-	x	dead and very dry
Spinifex longifolius	Gr		x	mmia02	x	-	
Sporobolus virginicus	Gr		x	-	x	-	
Family: Proteaceae (090)							
Grevillea eriostachya	Sh T		x	-	-	x	
Persoonia bowgada	Sh M	n	x	-	-	x	TK:P sp(Crav.7112), n on Nanga Stn
Family: Santalaceae (092)							
Anthobolus foveolatus	Sh M	n	x	-	-	x	TK: n is in F Peron N P
Exocarpos aphyllus	Sh MT		x	01, 02	x	x	
Santalum spicatum	Tr S		?	mmia01	-	-	TK: s of subsp nov; only on beach
Family: Sapindaceae (207)							
Alectryon oleifolius subsp. *oleifolius*	Sh MT		x	mmia01	-	x	
Dodonaea inaequifolia	Sh M		?	mmia01	-	-	
Family: Solanaceae (315)							
Solanum lasiophyllum	Sh S		x	mmia01	-	x	
Solanum orbiculatum subsp. *orbiculatum*	Sh MS		x	01, 02	-	x	
Family: Sterculiaceae (223)							

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Brachychiton gregorii	Tr S		x	-	-	near	very few in Monkey Mia Reserve
Family: Surianaceae (160)							
Stylobasium spathulatum	Sh M		x	01, 02	?	x	
Family: Thymelaeaceae (263)							
Pimelea microcephala	Sh M		?	mmia01	-	?	
Family: Zygophyllaceae (173)							
Nitraria billardierei	Sh M		x	mmia02	near	-	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Family: Poaceae (031)							
Austrostipa crinita	Gr		?	mmia01	-	-	
Austrostipa elegantissima	Gr		?	mmia01	-	-	
* *Cenchrus ciliaris*	Gr		?	mmia01	-	-	
Eragrostis dielsii	Gr		x	-	-	x	dead and very dry
Spinifex longifolius	Gr		x	mmia02	x	-	
Sporobolus virginicus	Gr		x	-	x	-	
Family: Proteaceae (090)							
Grevillea eriostachya	Sh T		x	-	-	x	
Persoonia bowgada	Sh M	n	x	-	-	x	TK:P sp(Crav.7112), n on Nanga Stn
Family: Santalaceae (092)							
Anthobolus foveolatus	Sh M	n	x	-	-	x	TK: n is in F Peron N P
Exocarpos aphyllus	Sh MT		x	01, 02	x	x	
Santalum spicatum	Tr S		?	mmia01	-	-	TK: s of subsp nov; only on beach
Family: Loranthaceae (097)							
Amyema preissii	Sh P		x	-	x	x	on Acacia sclerosperma & A. tetr.
Family: Chenopodiaceae (105)							
Chenopodium gaudichaudianum	Sh M		?	mmia01	-	-	
Enchylaena tomentosa	Sh S		?	mmia01	-	-	
Eremophea aggregata	Sh S	e?	?	mmia01	-	-	TK: largely restricted to WHA
Halosarcia halocnemoides subsp. *tenuis*	Sh S		x	-	-	-	
Halosarcia indica subsp. *bidens*	Sh S		x	-	-	-	
Halosarcia pruinosa	Sh S		x	-	-	-	
Maireana tomentosa	Sh S		x	mmia01	-	x	
Rhagodia latifolia subsp. *latifolia*	Sh M		x	mmia01	-	x	
Rhagodia preissii subsp. *obovata*	Sh SM		x	mmia02	x	x	
Salsola tragus	He		x	-	-	-	=Salsola kali
Sarcocornia quinqueflora	Sh S		x	-	-	-	
Threlkeldia diffusa	Sh SM		x	mmia01	?	x	
Family: Amaranthaceae (106)							
Ptilotus divaricatus var. *divaricatus*	Sh M		x	mmia01	-	x	
Ptilotus obovatus var. *obovatus*	Sh M		x	mmia01	-	x	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Ptilotus villosiflorus	He		?	mmia02	-	-	
Family: Nyctaginaceae (107)							
Commicarpus australis	Sh/Vi		x	mmia01	-	x	Sh/Vi M.
Family: Gyrostemonaceae (108)							
Gyrostemon ramulosus	Tr S		x	-	x	-	
Family: Aizoaceae (110)							
Carpobrotus candidus ms	He		x	-	x	-	flowers white
Family: Brassicaceae (138)							
* *Brassica tournefortii*	He		x	01, 02	x	x	
Lepidium biplicatum	Sh S	P2, n?	?	-	-	-	n in Yaringa Stn. PGW: 2km W MMia
Family: Crassulaceae (149)							
Crassula colorata var. *colorata*	He S	n	?	mmia02	-	-	CM: n in WHA
Family: Surianaceae (160)							
Stylobasium spathulatum	Sh M		x	01, 02	?	x	
Family: Mimosaceae (163)							
Acacia drepanophylla	Sh MT	P3, e?	x	mmia01	-	E of	e in Wannoo to Yaringa Stns
Acacia ramulosa var. *ramulosa*	Sh MT		x	mmia01	-	x	
Acacia sclerosperma subsp. *sclerosperma*	Sh MT	n	x	mmia02	x	x	TK: n of subsp is on Yaringa Stn
Acacia synchronicia	Sh MT		?	mmia01	-	-	
Acacia tetragonophylla	Sh MT		x	mmia01	-	x	
Family: Zygophyllaceae (173)							
Nitraria billardierei	Sh M		x	mmia02	near	-	
Family: Euphorbiaceae (185)							
Adriana tomentosa	Sh M		x	-	-	-	
Euphorbia drummondii	He		?	mmia01	-	-	
Family: Sapindaceae (207)							
Alectryon oleifolius subsp. *oleifolius*	Sh MT		x	mmia01	-	x	
Dodonaea inaequifolia	Sh M		?	mmia01	-	-	
Family: Malvaceae (221)							
Hibiscus sturtii var. *truncatus*	Sh S		?	mmia01	-	-	

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Sida calyxhymenia	Sh SM		?	mmia01	-	-	
Family: Sterculiaceae (223)							
Brachychiton gregorii	Tr S		x	-	-	near	very few in Monkey Mia Reserve
Family: Frankeniaceae (236)							
Frankenia pauciflora	Sh S		x	-	-	-	TK: type is from WHA
Family: Thymelaeaceae (263)							
Pimelea microcephala	Sh M		?	mmia01	-	?	
Family: Myrtaceae (273)							
Scholtzia leptantha	Sh SM		x	mmia02	x	-	= S. umbellifera & Thryp. sp. in part
Family: Asclepiadaceae (305)							
Marsdenia australis	Vi		x	-	-	x	= Leichardtia australis
Marsdenia graniticola	Sh S	n	?	mmia01	-	-	TK: Gymnea "granitica"; n in FPerNP
Rhyncharrhena linearis	Vi		?	mmia01	-	-	
Family: Convolvulaceae (307)							
Porana sericea	Vi		x	mmia01	-	x	
Family: Avicenniaceae (312)							
Avicennia marina	Tr VS		x	-	-	-	very few, young trees; < 0.5 m
Family: Solanaceae (315)							
Solanum lasiophyllum	Sh S		x	mmia01	-	x	
Solanum orbiculatum subsp. *orbiculatum*	Sh MS		x	01, 02	-	x	
Family: Myoporaceae (326)							
Eremophila clarkei	Sh MT		?	mmia01	-	-	
Eremophila maitlandii	Sh MT		x	-	-	x	
Family: Goodeniaceae (341)							
Lechenaultia linarioides	Sh M		x	mmia02	x	x	TK: n in FPerNP; very distinct form
Scaevola spinescens	Sh M		x	mmia01	-	x	
Scaevola tomentosa	Sh M		x	mmia01	-	x	
Family: Asteraceae (345)							
Angianthus cunninghamii	Sh S		x	-	-	-	
Brachyscome latisquamea	Vi/He	s	x	mmia01	-	x	Vi/He SM. TK: s is Tamala Stn

Taxon Name	Form	Code	MonMia	CALM	Res Ext	TP Ext	Comments
Calocephalus francisii	He		x	mmia02	?	x	dead and very dry
Chthonocephalus oldfieldianus	He	P1, n	?	-	-	-	nr old M Mia tip; new sp. for WHA
Chthonocephalus tomentellus	He	P2	?	-	-	-	GJK: rd sand 3 km W of M Mia
Gnephosis arachnoidea	He		?	mmia01	-	-	
Olearia occidentissima	Sh S	P2, e	?	mmia01	-	-	CM: e in WHA, widespread on P Pen
Podolepis canescens	He		?	mmia01	-	-	
Rhodanthe condensata	He		?	mmia02	-	-	
Rhodanthe humboldtiana	He		?	mmia01	-	-	
Sondottia glabrata	He	P2, e	?	-	-	-	TK:e in WHA. PGW:clay 2kmW MMia

APPENDIX C

Vegetation Structure Classes and Condition Scale Tables

Contents

TABLE 1: VEGETATION CLASSIFICATION TO BE USED IN WHEATBELT SURVEY

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70-100% d	MID-DENSE 30-70% c	SPARSE 10-30% i	VERY SPARSE 2-10% r
T Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees <5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs >2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB Shrubs 1 0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT Bunch grass >0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

Condition Scale

Pristine
Pristine or nearly so, no obvious signs of disturbance.

Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

Very Good
Vegetation structure altered, obvious signs of disturbance.
For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it.
For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Completely Degraded
The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Sources of Information

These are too numerous to list. Refer to References.

Scale — Keighery BJ 1994 *Bushland Plant Survey. A Guide to Plant Community Survey for the Community.* Wildflower Society of WA (Inc), Nedlands, Western Australia.

APPENDIX C

Fauna Survey and Thick-billed Grasswren Survey Reports by Bamford Consulting Ecologists

Fauna Survey of the Concept Development Plan Areas for the Monkey Mia Dolphin Resort

February 2002

B. Metcalf and M. Bamford

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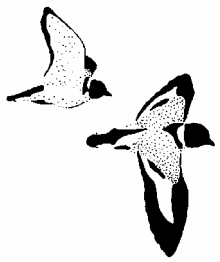

14/02/'02

INTRODUCTION

The Monkey Mia Dolphin Resort is situated on the eastern side of the Peron Peninsula, adjacent to the Francois Peron National Park and within the Shark Bay World Heritage Area. Due to the growing tourism value of the region, the Resort has decided to expand its operations with an increase in the availability of accommodation and a consequent expansion in its waste water treatment plant. Because of the Resort's position in such an ecologically important area, the Concept Development Plan is required to include information on the status of significant fauna species in these two areas. This report details the results of a review and survey to ascertain the status of significant fauna species in the region and especially the development sites, with a particular focus on the Thick-billed Grasswren *Amytornis textilis*.

The fauna survey was divided into two main components.

1) A survey of significant fauna species in the area, to determine:

- whether Malleefowl *Leipoa ocellata* were present within the survey area; and
- whether there was suitable habitat for other significant fauna (as per the CALM Threatened Fauna Database and the Commonwealths Environment Protection and Biodiversity Conservation Act (1999)).

2) a survey of the Thick-billed Grasswren population in the area, to determine:

- whether there was suitable habitat for Grasswrens within the development areas;
- whether the Grasswrens use the exotic vegetation within the resort;
- if Grasswrens are present within the development areas, would they be able to relocate if development occurs;
- the availability habitat for the Grasswrens in a regional and local context; and
- if the development proposal will have a significant impact on the Grasswren population in a regional and local context.

METHODS

Two main locations were surveyed for the Monkey Mia Concept Development Plan:

1) Expansion area of the Monkey Mia Dolphin Resort; an area on the northern and western sides of the existing Monkey Mia Dolphin Resort.

2) Expansion area of the waste water treatment plant; an area surrounding the existing waste water treatment plant.

Both areas are shown on Figure 1.

[Figure 1 - Map of Study Areas]

A field trip to the study areas was conducted between 29th January – 1st February 2002. All sites were traversed by foot and any species sighted, heard or for which tracks, scats, nests etc. were seen, was recorded. Bird censuses were conducted at all sites during morning, midday and afternoon periods. Where significant species were recorded, the number of individuals, activity and direction of travel was noted. In addition, any Thick-billed Grasswrens were monitored for as long as possible so that an approximate territory size and shape could be estimated.

Observations made on fauna in the field were supplemented by a search of the CALM Threatened Fauna Database and the Commonwealth's Environment Protection and Biodiversity Conservation (EPBC) Act (1999).
Vertebrate fauna species were identified using the following references:

Mammals:	Menkhorst & Knight (2001).
Birds:	Simpson and Day (1996).
Herpetofauna:	Cogger (1999).

RESULTS AND DISCUSSION

Thick-billed Grasswren; background information

Status

The Thick-billed Grasswren is currently classified as Vulnerable (Schedule 1) under both the Western Australian Wildlife Conservation Act 1950 and the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. Although formerly having a wide distribution over much of southern and western Australia, the species now has three widely separated, restricted populations in Western Australia (*A. t. textilis*), South Australia (*A. t. myall*) and New South Wales/South Australia (*A. t. modestus*) (Higgins *et al*., 2001). The subspecies *A. t. textilis* formerly occurred throughout southern and central Western Australia but is now restricted to the Shark Bay area (Brooker 2000).

Threats

Reasons for the marked decline in the population are not fully understood, however recent work by Brooker (2000) shows that the destruction of habitat by introduced herbivores may have had more bearing than predation from introduced predators, as suggested previously by Whitlock (1921). A change in vegetation structure due to changing fire regimes may also pose a threat to the species (Higgins *et al*. 2001; Brooker 1988).

Reproduction

Active nests of the species have been recorded between July – October in the Shark Bay region, with the nest generally being a deep cup shape and situated in the centre of low, dense shrubs. Clutch size is 1-3 eggs and both sexes assist in incubation. Brooker (2000) reported a high degree of correlation between wetter years and increased breeding success, perhaps due to an increase in vegetation density and a resultant increase in nesting cover.

Territoriality

Birds form pairs that are thought to maintain a territory of 4 – 5 ha throughout much of the year (Higgins *et al*. 2001), although groups of up to six have been sighted and territories of *ca*. 1 ha for breeding pairs have been reported (Brooker 1988). Birds appear to have a high degree of site fidelity with Brooker (1988) reporting a median movement of 90 metres and a maximum movement of 250 metres.

Habitat

The habitats in which Grasswrens are found on the Peron Peninsula have been described by Brooker (2000) as containing "recumbent acacias and low shrubs within the 0-1 metre height category, and shrub clumps of high foliage density". This habitat type is widespread on the

Peninsula and the adjacent mainland. Of the nine vegetation types recognised in the region (see Payne *et al*. 1987), Brooker (2000) found that three were suitable for the Grasswren, including Acacia Sandplain, Taillefer Spinifex and Toolonga Acacia Mixed Scrub. On the Peninsula itself the former two vegetation types are dominant, with small sections of Samphire around the numerous salt lakes being the only other recognised habitat type.

Thick-billed Grasswren; observations

Habitat suitable for Grasswrens is widespread in the Monkey Mia area as evidenced by the presence of three groups of Thick-billed Grasswrens seen throughout the Monkey Mia area. All groups are thought to have been family parties with a breeding pair, helpers and last year's young. Approximate territories for all groups are shown on Figure 2. The details of the three groups seen are as follows:

1) Consisted of 4-5 individuals seen in the south-western corner of the resort extension area. Individuals were seen foraging in leaf litter underneath *Acacia* spp. and other dense shrubs in the area.

2) Consisted of 4 individuals recorded from the carpark and nearby areas i.e. at the south eastern corner of the resort extension area. There is an unconfirmed report of this group breeding in the Bouganvillea Creeper on the nearby wall of the resort.

3) Consisted of 4-5 individuals recorded from the track leading up to the waste water treatment plant. Although this group was not recorded from either of the study areas, if the developments are allowed to go ahead the track upon which they were seen will have an increased usage and they will be impacted upon.

[Figures 2: Map showing Thick-billed Grasswren territories]

Use of exotic vegetation within the resort

Grasswrens were not recorded using the exotic vegetation within the resort although, as mentioned above, there were unconfirmed reports of one pair nesting in the Bouganvillea Creeper on the wall near the main carpark. In comparison with the Grasswren's normal habitat preferences, the exotic vegetation lacked a well-developed understorey, had few thick shrubs suitable for nesting and may have been too discontinuous to be maintained as a proper territory. The presence of overabundant species e.g. Silver Gulls *Larus novaehollandiae* and Little Crows *Corvus orru*, may also have discouraged Grasswrens from utilising the resort's vegetation.

Habitat availability

Brooker's (2000) work on the Grasswrens has shown that suitable habitat is abundant on the Peron Peninsula, with the two most widespread vegetation types on the Peninsula being utilised. However it must be recognised that vegetation is not static and the continued availability of habitat will depend on factors such as level of grazing by introduced herbivores, fire regimes and rainfall patterns (Higgins *et al*. 2000; Brooker 2000). Habitat also appears to be abundant on a local scale although once again, factors affecting the state of vegetation may reduce the suitability of the available habitat with time and improper management.

In terms of the possibility of Grasswrens relocating if the developments were to go ahead, there appears to be suitable habitat outside of, but close to, the two development areas. This would

support Schodde (1982) who stated that there often appeared to be large areas of suitable habitat between territories. Although the presence of such areas means that it would be possible for the Grasswrens to relocate if development occurred, whether they would do so successfully is unknown. As such it must be understood that a decision to allow the development to go ahead may result in the loss of at least part of the local population.

As an alternative to the Grasswrens relocating, active translocation of the birds in areas to be affected by the development could be considered, but this would have to be decided by the Department of CALM.

Impact of the development proposal on the Grasswren population

The northern section of Peron Peninsula is estimated to support a population of >10,000 Grasswrens with a density of 2-3 birds per hectare (Higgins *et al*. 2001). The size of the proposed developments is ~31 ha and with the same density of birds (2-3 birds/ha), the areas would be expected to support a maximum of 93 individuals, representing a maximum of 0.9% of the population, but probably considerably less. It is unlikely that the loss of this many individuals in a population of >10,000 would be considered significant in a regional context.

Mammals

No significant mammal species were recorded from the study areas and none is expected to be present, but a number of significant mammal species do occur in the Francois Peron National Park and may spread to the Monkey Mia area in the future. Those species for which there is suitable habitat in the Monkey Mia area include:

- Bilby *Macrotis lagotis*
  This species occupies a wide range of arid land habitats, including "red earths with Acacia shrubland" (Strahan, 1996) similar to that seen around the Waste Water Treatment Plant. The population on the Peron Peninsula has been reintroduced although historically the species has only been recorded from the mainland further east (Baynes, 1988).

- Banded Hare-Wallaby *Lagostrophus fasciatus fasciatus*
  This species appears to prefer areas of dense Acacia scrub, such as that around the Waste Water Treatment Plant, although nocturnal feeding usually occurs in more open areas (Strahan, 1996). The Banded Hare-wallaby currently appears to be restricted to Bernier and Dorre Islands, with a small reintroduced population on the Peron Peninsula.

- Rufous Hare-wallaby *Lagorchestes hirsutus*
  Although the Rufous Hare-wallaby appears to share the same distribution as the Banded Hare-wallaby (although with a second captive population in the Tanami region), their habitat preferences are quite different (Strahan, 1996). The Rufous Hare-Wallaby prefers areas of spinifex hummock grassland and sandplain shrubland, the latter of which is abundant in both study areas.

- Woylie *Bettongia penicillata ogylbii*
  The Woylie appears to prefer habitats that contain "a clumped, low understorey of tussock grasses or clumped, low woody scrub" (Strahan, 1996) the latter of which is abundant around the Monkey Mia area.

The Woylie is currently classed as a Priority 4 species by the Department of CALM, whilst the other three species are all classed as Vulnerable (Schedule 1) under both the WA Wildlife Conservation Act (1950) and the Commonwealth EPBC Act (1999).

A list of all mammal species recorded in the study areas is given in Appendix A. This list is undoubtedly incomplete, consisting of only one native and two introduced species, and native rodents, bats and possibly dasyurid marsupials may be present. These are all likely to be widespread in the region, so the impact of the development proposals upon them will be slight and will roughly reflect the proportion of habitat disturbed or altered.

Avifauna

Other than the Thick-billed Grasswren, no other bird species classified as significant by the Department of CALM were recorded from the study areas, although what appeared to be a rather old Malleefowl mound was recorded from the resort extension study area. Species of significance (as classified under the WA Wildlife Conservation Act (1950)) for which there is available habitat in the study area include:

- Malleefowl *Leipoa ocellata*
  This species prefers woodland/shrubland areas where there is abundant leaf litter and although it has always occurred on the Peron Peninsula (Storr, 1988), a population has recently been reintroduced to the Francois Peron National Park. It is classified as Vulnerable (Schedule 1) under both the WA Wildlife Conservation Act (1950) and the Commonwealth EPBC Act (1999).

- Bush Stone-curlew *Burhinus grallarius*
  This species occupies a range of woodland/shrubland habitats, preferring those that have an abundant leaf litter. This species was classified as an "uncommon resident" of the Peron Peninsula by Storr & Harold (1988).

- Thick-billed Grasswren *Amytornis textilis*
  This species has been discussed above.

Other significant avifauna recorded from the study areas included the Australian Shelduck *Tadorna tadornoides*, Black-breasted Buzzard *Hamirostra melanosternon*, White-bellied Sea-Eagle *Haliaeetus leucogaster*, Collared Sparrowhawk *Accipiter cirrhocephalus*, Brown Falcon *Falco berigora*, Nankeen Kestrel *Falco cenchroides*, Common Greenshank *Tringa nebularia*, Grey-tailed Tattler *Tringa brevipes* and Curlew Sandpiper *Calidris ferruginea*, all of which are listed as migratory species under the EPBC Act (1999) and all of which were recorded from near the sewage ponds at the Waste Water Treatment Plant. Other species listed as migratory under the EPBC Act (1999) that may occur in the study areas are given in Appendix B.

A list of all avifauna species recorded in the study areas is given in Appendix A. This list is extensive as birds are conspicuous and can be readily identified by an experienced observer, but will lack some cryptic species and those that are seasonal or intermittent visitors. With the exception of some of the significant avifauna described above, all species observed or expected to utilise the site are likely to be widespread in the region, so the impact of the development proposals upon them will be slight and will roughly reflect the proportion of habitat disturbed or altered.

Frogs and reptiles

Although a variety of reptile species was recorded from the site, particularly agamids (dragon lizards) and varanids (monitor lizards or goannas), no species classified as significant were recorded. No significant species of frogs are expected on the site, but reptile species of significance for which there is available habitat include:

- Woma *Aspidites ramsayi*
  This species is an arid land specialist, feeding on a variety of small mammal, bird and reptile species. There is only one historic record of the species from the Peron Peninsula (Storr & Harold 1988), possibly indicating that the population, if still present, has never been very large. This species is classified as Schedule 4 under the Western Australian Wildlife Conservation Act (1950).

- Western Spiny-tailed Skink *Egernia stokesii badia*
  This skink occurs in semi-arid woodlands and scrublands, where it shelters in hollow logs and behind exfoliating bark. This subspecies has several disjunct populations throughout south-western Western Australia with one in the Shark Bay region. The subspecies is classified as Endangered under both Schedule 1 of the Western Australian Wildlife Conservation Act (1950) and the Commonwealth EPBC Act (1999).

A list of all reptile species recorded in the study areas is given in Appendix A. This list is undoubtedly incomplete, as a total of 30-40 reptile species and a small number of frog species could be expected to occur at a single location in this area. As noted above, with the exception of some significant species, those observed or expected to be present are likely to be widespread in the region, so the impact of the development proposals upon them will be slight and will roughly reflect the proportion of habitat disturbed or altered.

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0 50 150 250m

Scale 1:5000

Figure 1

Monkey Mia Study Area

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

LEGEND

Thick Billed Grass Wren Territories

N

0 50 150 250m

Scale 1:5000

Figure 2

Thick Billed Grass Wren Terriotories

BOWMAN BISHAW GORHAM

ENVIRONMENTAL MANAGEMENT CONSULTANTS

Appendix A - Vertebrate Fauna Species Recorded from the Study Areas

RE: Resort Extension Study Area.
WWTP: Waste Water Treatment Plant.
X: Species recorded from study area.
S: Scats, tracks and/or traces of species recorded from study area.

Mammals		**RE**	**WWTP**
MACROPODIDAE			
Euro	*Macropus robustus*		X
BOVIDAE			
Feral Goat	*Capra hircus*		X
LEPORIDAE			
Rabbit	*Oryctolagus cuniculus*	X	X

Avifauna		**RE**	**WWTP**
MEGAPODIIDAE			
Malleefowl	*Leipoa ocellata*	S	
ANATIDAE			
Australian Shelduck	*Tadorna tadornoides*		X
PELECANIDAE			
Australian Pelican	*Pelecanus conspicillatus*		X
ARDEIDAE			
White-faced Heron	*Egretta novaehollandiae*		X
ACCIPITRIDAE			
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		X
Collared Sparrowhawk	*Accipiter cirrhocephalus*		X
Black breasted Buzzard	*Hamirostra melanosternon*		X
FALCONIDAE			
Brown Falcon	*Falco berigora*	X	X
Australian Kestrel	*Falco cenchroides*		X
SCOLOPACIDAE			
Curlew Sandpiper	*Calidris ferruginea*		X
Common Greenshank	*Tringa nebulari*		X
Grey-tailed Tattler	*Tringa brevipes*		X
LARIDAE			
Silver Gull	*Larus novaehollandiae*	X	
COLUMBIDAE			
Crested Pigeon	*Ocyphaps lophotes*		X
Common Bronzewing	*Phaps chalcoptera*	X	X
CAPRIMULGIDAE			
Spotted Nightjar	*Eurostopodus argus*		X
MALURIDAE			
Thick-billed Grasswren	*Amytornis textilis*	X	
Variegated Fairy-wren	*Malurus lamberti*	X	X
White-winged Fairy-wren	*Malurus leucopterus*		X
PARDALOTIDAE			
Inland Thornbill	*Acanthiza apicalis*	X	X
White-browed Scrubwren	*Sericornis frontalis*	X	X

Avifauna (cont.)		**RE**	**WWTP**
MELIPHAGIDAE			
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		X
Singing Honeyeater	*Lichenostomus virescens*	X	X
Yellow-throated Miner	*Manorina flavigula*		X
PETROICIDAE			
Southern Scrub-robin	*Drymodes brunneopygia*	X	X
POMATOSTOMIDAE			
White-browed Babbler	*Pomatostomus superciliosus*	X	X
CINCLOSOMATIDAE			
Chiming Wedgebill	*Psophodes occidentalis*		X
PACHYCEPHALIDAE			
Grey Shrike-thrush	*Colluricincla harmonica*		X
Crested Bellbird	*Oreoica gutturalis*		X
CORVIDAE			
Little Crow	*Corvus bennetti*	X	X
PASSERIDAE			
Zebra Finch	*Taeniopygia guttata*		X
HIRUNDINIDAE			
Welcome Swallow	*Hirundo neoxena*	X	X

Herpetofauna		**RE**	**WWTP**
AGAMIDAE			
Spotted Dragon	*Ctenophorus maculatus*	X	X
Military Dragon	*Ctenophorous isolepis*	X	
VARANIDAE			
Gould's Monitor	*Varanus gouldii*		X

Appendix B – Migratory species that may occur in the study areas

The Migratory Species list in the EPBC Act (1999) consists of those species listed under the: Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals - (Bonn Convention).

The list below consists predominantly of those species recorded from the area during the current Australian Bird Atlas (see http://www2.abc.net.au/birds/mapviewer.html) that are also listed as migratory under the Commonwealth EPBC Act (1999). The list is not exhaustive, but will cover the majority of species expected to occur in the development areas.

Common Name	Scientific Name
Malleefowl	*Leipoa ocellata*
Australian Shelduck [a]	*Tadorna tadornoides*
Great Egret	*Ardea alba*
Wedge-tailed Eagle	*Aquila audax*
Spotted Harrier	*Circus assimilis*
White-bellied Sea-Eagle [a]	*Haliaeetus leucogaster*
Whistling Kite	*Haliastur sphenurus*
Osprey	*Pandion haliaetus*
Collared Sparrowhawk [a]	*Accipiter cirrhocephalus*
Brown Goshawk	*Accipiter fasciatus*
Black breasted Buzzard [a,b]	*Hamirostra melanosternon*
Brown Falcon [a]	*Falco berigora*
Nankeen Kestrel [a]	*Falco cenchroides*
Grey Falcon	*Falco hypoleucos*
Common Sandpiper	*Actitis hypoleucos*
Sharp-tailed Sandpiper [b]	*Calidris acuminata*
Curlew Sandpiper [a]	*Calidris ferruginea*
Red-Necked Stint	*Calidris ruficollis*
Wood Sandpiper [b]	*Tringa glareola*
Common Greenshank [a]	*Tringa nebulari*
Marsh Sandpiper	*Tringa stagnatilis*
Bar-tailed Godwit	*Limosa laponica*
Sanderling	*Calidris alba*
Terek Sandpiper	*Xenus cinereus*
Grey-tailed Tattler [a,b]	*Heteroscelis brevipes*
Great Knot	*Calidris tenuirostris*
Red Knot	*Calidris canutus*
Banded Stilt	*Cladorhynchus leucocephalus*
Black-winged Stilt	*Himantopus himantopus*
Red-necked Avocet	*Recurvirostra novaehollandiae*
Grey Plover	*Pluvialis fulva*
Red-capped Plover	*Charadrius ruficapillus*
Lesser Sand Plover	*Charadrius mongolus*
Greater Sand Plover	*Charadrius leschenaultii*
Oriental Plover	*Charadrius veredus*
Black-fronted Dotterel	*Elseyornis melanops*
Brown Songlark	*Cinclorhamphus cruralis*
Rufous Songlark	*Cinclorhamphus mathewsi*

[a] Species recorded from the area during the current survey.
[b] Species not recorded from the area during the current Australian Bird Atlas, but expected to occur in the area and some were seen in the current survey.

THICK-BILLED GRASSWREN SURVEY, MONKEY MIA

February 2003

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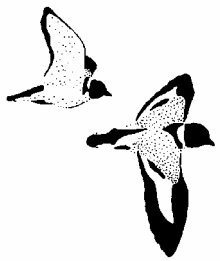

12/02/'03

EXECUTIVE SUMMARY

As part of the Environmental Impact Assessment process associated with the proposed expansion of the Monkey Mia Dolphin Resort, Bamford Consulting Ecologists was commissioned to undertake a detailed survey of the western race of the Thick-billed Grasswren *Amytornis textilis textilis*, known to be abundant in the Monkey Mia region. The western race of the Thick-billed Grasswren is classed as Vulnerable under the Federal Environment Protection and Biodiversity Conservation Act. It was also listed as Schedule 1 (Vulnerable) under the WA Wildlife Conservation Act until recently, but has been adjusted to Priority 4 (a lower level of conservation significance).

The aim of this assessment is to gather information on the Thick-billed Grasswren within areas likely to be affected by proposed expansions, and in the region generally. Specific aims are:

- Determine the number of Thick-billed Grasswrens and their locations in the area proposed for the development of staff accommodation (part of Lot 105).
- Determine the number of Thick-billed Grasswrens and their locations in the Monkey Mia region generally. The aims of this regional survey are to:
  1. Determine if the area proposed for staff accommodation is unusually important or not for Grasswrens;
  2. To locate any areas where Grasswren population density is particularly high;
  3. To investigate anecdotal evidence that Grasswrens utilise exotic plants within the existing resort for foraging and nesting.
- Review the literature to see if Grasswren populations around Monkey Mia and in the Shark Bay region generally are tending to increase, and to see if there is any information on their patterns of movement and capacity for relocation.

Thick-billed Grasswrens are sedentary, occur as pairs or small groups in territories that are an average of 1.5ha in size, and density estimates range from 0.76 to 2.8 Grasswrens/ha. The species occurs in dense, low vegetation and its decline has been linked to the loss of such vegetation due largely to clearing and grazing by livestock and introduced herbivores.

Field surveys for this project took place from 11th-14th February 2003. Work consisted mainly of locating Grasswrens in the area of the proposed development and elsewhere around the Monkey Mia Resort in order to develop an understanding of the local pattern of distribution of he species. Location data for other sedentary, ground-dwelling bird species were also collected.

Fourteen groups of Grasswrens and a minimum of 33 birds were located across approximately 50ha around the Monkey Mia Resort. The territory of one group was almost entirely within the proposed development area, while a second group overlapped slightly with this area. Grasswrens were concentrated around the resort, especially the carpark, and in an area of particularly suitable shrubland about 300m south of the resort. Except close to the resort, Grasswrens were generally less abundant on the coastal, white

sands compared with the inland red loam soils, probably because the vegetation structure was more suitable for the species on the latter.

The concentration of Grasswrens around the resort appeared to be because they had learnt to forage on insects collected in the fronts of cars and around lights, but the birds did not venture more than about 10m from dense, natural vegetation. There were no records of Grasswrens within the resort itself, and no evidence of nesting in garden plants.

The proposed expansion will displace one group of Grasswrens and may slightly affect a second group. This second group, however, will probably be little affected if a buffer of native vegetation is retained between the Denham-Monkey Mia Road and the expansion. The displaced group of Grasswrens will be forced into other Grasswren territories and will probably break up, but there may be some potential for this group to persist if some native vegetation can be retained alongside and within the development.

During the field survey, it was noted that although the Grasswrens are very conspicuous around the carpark, no attempt appears to have been made to inform visitors to the nearby Dolphin centre of the conservation significance of these birds.

CONTENTS

INTRODUCTION

As part of the Environmental Impact Assessment process associated with the proposed expansion of the Monkey Mia Dolphin Resort, Bamford Consulting Ecologists was commissioned to undertake a detailed survey of the western race of the Thick-billed Grasswren *Amytornis textilis textilis*. All three races of this species are of conservation significance, and the western race is classed as Vulnerable under the Federal Environment Protection and Biodiversity Conservation Act. It was also listed as Schedule 1 (Vulnerable) under the WA Wildlife Conservation Act until recently, but has been adjusted to Priority 4 (a lower level of conservation significance) because it is abundant and the population is stable in a small area, while stock removal from this area may be leading to population increases. It is considered significant because of the extreme contraction in its distribution that has occurred since about 1900, with the race now occupying probably <1% of its former range. It is now restricted to two areas in the Shark Bay region: Peron Peninsula and parts of Woodleigh and Hamelin Stations (Brooker 2000). Monkey Mia is recognised as a location where the race is abundant and readily observed.

The proposed expansion of the Monkey Mia Resort is to the west of the existing facility, which occupies Lot 104. An area of about 2ha immediately to the west of the resort is proposed for future visitor accommodation and was assessed for Thick-billed Grasswrens and other fauna in February 2002 (Metcalf and Bamford 2002). Grasswrens were present in this area. Further expansion, for staff accommodation, is proposed for another area of <2ha in lot 105, immediately west of the expansion area assessed in 2002. The total area for both proposed visitor facilities and staff accommodation is therefore <4ha.

The aim of this assessment is to gather additional information on the Thick-billed Grasswren within areas likely to be affected by proposed expansions, and in the region generally. Specific aims are:

- Determine the number of Thick-billed Grasswrens and their locations in the area proposed for the development of staff accommodation (part of Lot 105).
- Determine the number of Thick-billed Grasswrens and their locations in the Monkey Mia region generally. The aims of this regional survey are to:
    4. Determine if the area proposed for staff accommodation is unusually important or not for Grasswrens;
    5. To locate any areas where Grasswren population density is particularly high;
    6. To investigate anecdotal evidence that Grasswrens utilise exotic plants within the existing resort for foraging and nesting.
- Review the literature to see if Grasswren populations around Monkey Mia and in the Shark Bay region generally are tending to increase, and to see if there is any information on their patterns of movement and capacity for relocation.

METHODS AND BACKGROUND INFORMATION

Monkey Mia Resort was visited from 11th to 14th February 2003 by Dr M. Bamford of Bamford Consulting Ecologists. This visit followed discussions with staff at Bowman Bishaw Gorham, with Mr Brenden Metcalf, who had carried out work on the resort expansion area in February 2002 (Metcalf and Bamford 2002), with Dr Mike Brooker who had worked on the Thick-billed Grasswren in the Peron Peninsular region, including around Monkey Mia, in the late 1980s, and with Dr Belinda Cale (nee Brooker) who carried out doctoral research on the species at a site 5km west of Monkey Mia in the 1990s (Brooker 1998). Activities conducted to achieve the aims outlined above were as follow:

Surveys to determine the distribution and abundance of Thick-billed Grasswrens

The distribution and abundance of Grasswrens in the Monkey Mia region in general and in the area for the proposed expansion of staff accommodation were determined by searching for the birds on foot. The call of the Grasswren is distinctive and generally gives its presence away if they are approached within about 25m, while the birds are recognisable even if seen from a distance of 50m, although they are heard more often than seen. Therefore, searching was undertaken by walking transects through an area, using a hand-held GPS unit to ensure that transects were *ca.* 50m apart. By this means, more or less total coverage of an area could be achieved, although it is highly unlikely that all Grasswrens were recorded on any one survey, as the species is cryptic and difficult to detect if the birds are quiet and motionless. For this reason, locations of greatest interest, such as the resort and accommodation expansion areas, were searched on several occasions.

Searching for Grasswrens was usually carried out in the mornings (0730-1100 hours) and late afternoons (1600-1900 hours), as the birds are easiest to observe at such times. Areas of greatest interest, such as those for the proposed resort expansion and staff accommodation, were searched repeatedly as noted above, whereas other areas were searched at least once. Areas searched, and the frequency, time and duration of searches, are presented in Table 1. Figure 1 illustrates the layout of these areas.

When a Grasswren was observed, the location where it was first seen was recorded with a handheld GPS (Northings and Eastings, using Australian Datum WSG84). Birds were usually heard first, but their location was not recorded until they were seen. Sightings were assigned to a territory or group during a transect, when it was clear that different birds were being seen, and subsequent observations in the same area were assigned to the territory or group of the nearest previous sighting. In addition, the locations of other ground-dwelling birds that occur in the area, including the White-browed Scrubwren *Sericornis frontalis*, White-browed Babbler *Pomatostomus superciliosus*, Variegated Fairy-wren *Malurus lamberti*, White-winged Fairy-wren *Malurus leucopterus*, Southern Scrub-robin *Drymodes brunneopygia* and Chiming Wedgebill *Psophodes occidentalis* were also recorded. These are all sedentary, ground-dwelling species that will suffer loss of habitat due to the proposed developments, and have contracted in range due to clearing

in agricultural areas (Saunders and Ingram 1995). Where possible, the numbers and, in the case of Grasswrens, sex of birds was noted.

Habitat assessment for the Thick-billed Grasswren

Brooker (1998, 2000) determined that the distribution of the Thick-billed Grasswren is related to structural characteristics of vegetation, with the species largely confined to areas with a high density of vegetation close to the ground. She suggested that the dramatic decline of the species in pastoral areas has been largely due to the impact of introduced (eg. Rabbits *Oryctolagus cuniculus* and Goats *Capra hircus*) and domestic herbivores (eg. Sheep *Ovis aries*) upon vegetation density. The persistence of the species in the Shark Bay area appears to be related to the productivity of vegetation in this area compared with other pastoral districts, with this productivity allowing for some grazing without excessive loss of vegetation density, although other factors (eg. fire, stocking rates and other management practices) are undoubtedly involved.

The technique for the assessment of vegetation structure used by Brooker (2000) was used in the area for resort expansion and proposed staff accommodation to determine how this area compared with the criteria for favoured habitat that she determined. This technique involves the use of a pole marked at 0.5m intervals and placed at regular points along a transect, with the vegetation structure scored by recording the percentage of pole placements at which perennial vegetation touched the pole within each height category. In the analysis presented by Brooker (2000), vegetation height categories of 0-1m, 1-2m and >2m were used, and it was found that there were significant differences in the density of the lower and higher height categories between sites with and without Grasswrens. Specifically, at sites where Grasswrens were present, the mean vegetation cover was 34.4% (0-1m) and 3.8% (>2m). At sites where Grasswrens were not recorded, the mean vegetation cover was 23.2% (0-1m) and 13.3% (>2m). Sites with Grasswrens had more, low vegetation but less high vegetation than sites without Grasswrens. There was no significant difference between sites with and without Grasswrens in the density of vegetation 1-2m (17.5% compared with 22.7%).

In the area for resort expansion and proposed staff accommodation, and immediately south of the Monkey Mia to Denham Road, vegetation structure was scored using a marked pole on a 20m by 20m grid, with the grid determined using a handheld GPS. Although a hand-held GPS unit is not entirely accurate, it did provide points that were selected without reference to the vegetation structure. A total of 155 pole locations was surveyed in the area of the resort expansion and proposed staff accommodation, with 29 locations south of the Monkey Mia to Denham Road. The presence/absence of vegetation was scored in the categories 0-1m and 1-2m and >2m, and in addition the presence/absence of leaf-litter was scored at each point. This had not been done by Brooker (2000), but she had noted that leaf-litter was used by the species when foraging. This behaviour was also observed during the present survey.

Results of vegetation structure surveys are presented in Appendix 1. Percentage cover in each vegetation class was as follows:

	leaf litter	0-1m	1-2m	>2m
expansion area	38%	47%	19%	12%
south of road	34%	41%	4%	1%

In both areas, percentage cover of low (0-1m) vegetation was sufficient to support Grasswrens.

Additionally, the study site used by Brooker (1998) was visited to provide a visual comparison with the vegetation in the immediate vicinity of Monkey Mia. This visit took place on 12th February 2003 from 1115 to 1200 hours. Despite the time of day, 4 Grasswrens were observed, as were Variegated Fairy-wrens, White-browed Scrubwrens and White-browed Babblers. The site characteristics were quite unlike those of the expansion area, with red loam soil rather than white sand and different species of dominant acacias. In addition, while percentage cover of vegetation may have been similar, the vegetation was more uniformly distributed at Brooker's site, whereas in the expansion area the acacias that dominated the vegetation formed discrete clumps that were separated by clearings and sparse shrubs. Vegetation and soils south of the Denham to Monkey Mia Road at Monkey Mia were more similar to those at Brooker's site than to those of the expansion area.

Biology of the Thick-billed Grasswren

Information on the biology of the Thick-billed Grasswren was obtained from Brooker (1998, 2000) and Higgins *et al.* (2001).

The Thick-billed Grasswren is sedentary and occurs in pairs (sometimes groups of three) that occupy permanent territories that range in size from 1.2 to 2ha (Brooker 1998). Mean territory size is 1.5ha. The overall density of Grasswrens was found to be 0.76 to 0.84/ha at B. Brooker's site 5km west of Monkey Mia (Brooker 1998), but was 2.2 to 2.8/ha at a site studied by M. Brooker (Brooker 1988) 300m south of the Monkey Mia resort. This was within Survey Area 4 of the present study.

The species is insectivorous but will take some seeds and fruit. It forages mainly on the ground and, as discussed above, is dependent upon dense, low vegetation, with its dramatic decline linked to the loss of this dense vegetation over large areas. In addition, it requires particularly dense thickets for nesting, with the nest placed as little as 10cm above the ground within very dense vegetation.

Breeding occurs in the period July to October. The species may breed as simple pairs or cooperatively, with an additional adult assisting at the nest, while the young remain with the adults for at least four months after fledging. For example, Metcalf and Bamford (2002) found several groups of 4 or 5 birds at Monkey Mia in February 2002 and these

presumably consisted of adults and recently-fledged young. Breeding success is greatly influenced by winter rainfall, being poor in years of low rainfall.

THE THICK-BILLED GRASSWREN IN THE MONKEY MIA REGION

Patterns of distribution

Nine pairs and five groups of three Thick-billed Grasswrens were located in the Monkey Mia region (Figure 1 and Appendix 2). In at least two of the groups of three, one of the birds was immature. This suggests that breeding success had been poor in the previous breeding season, probably because of low winter rainfall in 2002.

The 14 pairs or groups represented a minimum of 33 birds present in an area of approximately 50ha, although unsuitable habitat such as roads, buildings and coastal dunes was included in this area. Therefore, an overall minimum density of just under 1/ha is suggested, which is consistent with the density found by Brooker (1998) but less than that found by Brooker (1988). However, it appears likely that the population was at an unusually low level in February 2003 because of poor breeding success, while it is very unlikely that all birds were located in the four days of searching undertaken. It is probable that the actual density of Grasswrens around Monkey Mia is consistently greater than the 0.76 to 0.84/ha found by Brooker (1998) in her intensive study 5km to the west of the resort.

The Grasswrens were not evenly distributed around Monkey Mia and there were two areas of concentration of birds (see Figure 1). The greatest concentration of birds was around the resort itself, where there were two pairs and a group of three birds in the carpark outside the caravan park, and another group of three birds living on the southern edge of the resort. There was also a group of three birds with a territory to the south and west of the existing resort which was therefore largely within the proposed resort expansion area.

The Grasswrens observed around the resort represented nearly half (16) of all birds recorded in total, but in an area of <5ha, and all were using both natural and created habitats. The birds in the carpark were seen regularly collecting dead insects from the fronts of cars and were even getting into the engine bay of vehicles to search for food. The birds along the southern edge of the resort were seen foraging under buildings within 25m of the generator, and right up to a paved area around a barbeque. This was seen early in the morning, so possibly the birds were collecting insects that had been attracted to lights the previous night.

Despite these observations, the birds around the resort were never more than 10m from the nearest native vegetation. Early in the morning, before the arrival of cars, at least some of the carpark Grasswrens were on the south side of the road in native vegetation and apparently moved into the carpark only to forage, although B. Brooker (pers. comm.) suspects they may nest in some of the dense acacias retained within the carpark. There

were no old nests in bougainvilleas planted along the resort fence, and it was not possible to confirm anecdotal reports that the Grasswrens have nested in such locations in the past. Overall, it appeared that Grasswrens were attracted to the periphery of the resort, where native vegetation had been retained and provided them with cover, and where human activities (vehicles, lights) resulted in a concentration of food. The fact that three of the five groups of three Grasswrens were located around the resort suggests that breeding success may be greater as a result of this concentration of food. The birds were more readily observed in this area than elsewhere, however, so other groups of three or more may have been missed in areas where the birds were entirely within native vegetation.

The second concentration of Grasswrens was in the red soil areas in the east of Survey Area 4 (Figure 1); precisely the location intensively studied by Brooker (1988). The vegetation in this area appeared particularly favourable for Grasswrens, with *Acacia tetragonophylla* forming large, dense, prickly thickets. There were lower densities of Grasswrens elsewhere in Survey Area 4, while Grasswrens were poorly represented in the acacia shrublands on the white sands of the coastal sandplain. On this coastal sandplain away from the influence of the resort, there was one pair of Grasswrens several hundred metres to the south of the resort in Survey Area 6, and two along the Denham to Monkey Mia Road west of the resort in Survey Area 1. One of these pairs was partly within the proposed staff accommodation area, but this pair also regularly crossed the road to forage along the base of the breakaway of the inland red soils. Both the pairs along the Denham to Monkey Mia Road were in an area where runoff from the road may have influenced vegetation density and productivity.

Although the density of Grasswrens was clearly lower in acacia shrubland on the white coastal sandplain compared with acacia shrubland on the inland red soils, the vegetation structure on the coastal sands appeared suitable for the birds. The vegetation on the red soils may have supported higher densities of Grasswrens because the *A. tretragonophylla* formed very dense, prickly thickets compared with the more open thickets and dispersed vegetation of non-prickly species on the coastal sands. More detailed analysis of vegetation structure would be required to quantify these characteristics and differences.

Thick-billed Grasswrens in the resort expansion and proposed staff accommodation areas

The territory of one group of Grasswrens was almost entirely within the area of the resort expansion, while the territory of another group was partly within the area of the proposed staff accommodation (Figure 1). This is consistent with the coastal sandplains supporting lower densities of Grasswrens than the inland red soils except where the birds are influenced by anthropogenic factors. The group in the resort expansion area was regularly observed along the western edge of the existing resort and was even observed in foredune vegetation. This pair occasionally foraged around buildings and vehicles on the edge of the resort but did not enter the resort itself. In general, the existing resort does not offer the sort of dense vegetation that the birds utilise for shelter. The second pair in the proposed development area was observed more often south of the Denham to Monkey Mia Road than actually in the development area.

THE DISTRIBUTION OF OTHER SEDENTARY, GROUND-DWELLING BIRDS IN THE MONKEY MIA REGION

As noted above, the locations of other ground-dwelling birds that occur in the area, including the White-browed Scrubwren, White-browed Babbler, Variegated Fairy-wren, White-winged Fairy-wren, Southern Scrub-robin and Chiming Wedgebill, were also recorded (Figure 2 and Appendix 3). With the exception of the Chiming Wedgebill, all were present within the proposed development areas but all were recorded elsewhere in the Monkey Mia region, with densities of at least some species higher on the inland red soils than the coastal white sands. Except for two records of White-browed Scrubwrens, there were no records of any of these species within the resort and its gardens of non-native plant species.

CONCLUSIONS AND RECOMMENDATIONS

With respect to the aims of this survey, the following conclusions and recommendations can be made.

A minimum of 33 Thick-billed Grasswrens is present in approximately 50ha immediately around Monkey Mia, although this is likely to be an underestimate because the survey was carried out over only a short period at a time of the year when the birds call infrequently (M. Brooker, pers. com.). The population is also likely to have been unusually low due to poor rainfall the preceding winter. Under natural conditions, this population is likely to be concentrated in *Acacia tetragonophylla* shrubland on inland red soils, but there is a marked concentration of birds around the existing resort, probably attracted to insects that accumulate on vehicles and around lights. Away from the resort, Grasswren numbers appear to be low on the coastal white sands, with large areas over which no Grasswrens were located.

Despite the concentration of Grasswrens around the resort, the birds are still dependent upon native vegetation and rarely ventured far from the cover this provides. Very little usage was made of current gardens although birds were observed on lawns adjacent to retained acacia shrubland.

Grasswren numbers are low in the resort expansion and proposed staff accommodation areas with only one group (of 14 recorded in the region) largely restricted to the development area, and a second group partly within this area. This second group can probably adjust its territory to accommodate the development, especially as it is planned to retain native vegetation alongside the Denham-Monkey Mia Road. The group whose territory greatly overlaps the development, however, will be displaced. Young Grasswrens have been recorded moving distances of up to 400m (Brooker 1998), so it is likely that the affected group could adjust its territory, but this could force them into the territories of other pairs. The possibility therefore exists that this group of Grasswrens would be broken up and the territory lost.

The impact of the proposed developments on the Grasswrens might be lessened by the retention of native vegetation, particularly large acacias, which is planned as a buffer along the Denham to Monkey Mia Road. This retention of vegetation along the road would protect part of the territory of the group of Grasswrens likely to be displaced by the development. Native vegetation could also be retained within the development, with local shrub species used as a water conservation measure and to create Grasswren habitat. Given the abundance of Grasswrens around the existing development, it is possible that through the retention and creation of suitable vegetation around and within the new development, Grasswren numbers may increase on the site. Note that the other ground-dwelling bird species do not seem to have benefited from the existing resort to the same extent as the Grasswrens, and therefore may be more adversely affected by the proposed developments than them. Retention and creation of native vegetation within the development may also benefit these other species and to some extent compensate for the loss of habitat.

Although not brightly coloured, the Thick-billed Grasswrens are attractive and have an engaging personality, particularly when seen foraging around cars and people's feet. They also have a remarkable story to tell of a population collapse but persistence and survival in a small area. Existing displays associated with the Dolphins appear to make no mention of the Grasswrens, and this may be an opportunity for promoting environmental awareness that is being missed. The Thick-billed Grasswren is considered to be sufficiently secure in the Shark Bay area that its level of conservation significance has been reduced by State authorities, but it remains a species that has disappeared from over 90% of its range. The change in its status appears to be related to the species being secure rather than to any documented population increase or range expansion.

TABLE ONE. Areas where searching for Thick-billed Grasswrens and other birds was carried out, indicating the times and durations of searches. The layout of these search areas is indicated on Figure 1.

Area 1. Expansion area for resort and staff accommodation.
Description: Acacia shrubland on white coastal sands.
Number of searches: 5.
Times when searched: 11th Feb. 1345-1500, 1700-1830.
12th Feb. 0820-0920, 1630-1730.
13th Feb. 0750-1050.
Total duration of searches: 7.75 hours.

Area 2. Carpark and existing resort.
Description: Around carpark, Acacia thickets >2m high have been retained and form hedgerows between sets of parking bays. Acacia thickets extend into lawn areas around the CALM facility and close to the restaurant. Between the resort and the Monkey Mia-Denham Road, natural acacia shrubland has been retained, with about 40% total vegetation cover. This area backs onto existing staff accommodation and the power generator. Vegetation within the resort area itself consists of lawn and palm trees, with some planted Sheoaks and very little dense vegetation, except for some shrubs in garden beds and bougainvilleas against some walls.
Number of searches: 4
Times when searched: 11th Feb. 1330-1345.
12th Feb. 0730-0815, 1600-1630.
14th Feb. 0645-0700
Total duration of searches: 1.5 hours.

Area 3. South of Monkey Mia-Denham Road: inner zone.
Description: A narrow strip of acacia shrubland on coastal white sands, with a low breakaway leading up to a plateau of mixed shrubland on red sandy-loam. Vegetation on the red sandy-loam is sparse and degraded, particularly close to the breakaway.
Number of searches: 2
Times when searched: 11th Feb. 1830-1900.
12th Feb. 0920-1020, 1730-1845.
13th Feb. 1045-1130.
Total duration of searches: 3.5 hours.

Area 4. South of Monkey Mia-Denham Road: outer zone.
Description: Mixed shrubland on red loam. Shrub cover high (30-40%) and thickets often very dense, with *Acacia tetragonophylla* dominant.
Number of searches: 2
Times when searched: 13th Feb. 1800-1845.
14th Feb. 0730-0915.
Total duration of searches: 2.5 hours.

Area 5. West of proposed staff accommodation area and north of Monkey Mia-Denham Road.
Description: Vegetation similar to other areas of coastal white sands, a shrubland of acacia.
Number of searches: 1
Times when searched: 13th Feb. 1700-1800.
Total duration of searches: 1 hour.

Area 6. South of Monkey Mia, on coastal sands.
Description: Coastal white sands supporting an acacia shrubland.
Number of searches: 2.
Times when searched: 13th Feb. 1845-1915.
14th Feb. 0915-1000.
Total duration of searches: 1.25 hours.

FIGURE ONE. Location of Grasswrens in the Monkey Mia region. Locations of the same pair or group of birds are enclosed within broken lines that indicate the approximate extent of each territory. Also indicated are Areas 1-6, the existing resort and Lots 104 and 105.

Datum: WGS'84

Figure 1

Location of Grasswren Families in the Monkey Mia Region

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

FIGURE TWO. Locations of all records of other bird species of interest.

771750mE
772000mE
772250mE
772500mE
772750mE
7144250mN
7144000mN
7143750mN
Lot 104
Lot 105
1
2
3
4
5
6
LEGEND
Scrub-Robin Location
Wedgebill Location
Babbler Location
Scrubwren Location
White-wing Fairy-wren Location
Variegated Fairy-wren Location
Area Outline
Cadastral Boundary
N
0 25 75 125m
Scale 1:3000
Datum: WGS'84

Figure 2

Selected Bird Species Located in the Monkey Mia Area

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

REFERENCES

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APPENDIX ONE. Results of vegetation structure surveys at Monkey Mia. See Methods for details.

A. Resort expansion and proposed staff accommodation area

Transect No.	Easting	Northing	Litter	0-1 m	1-2 m	>2 m
1	49 772 280	7 144 060	+	+	+	+
1	49 772 280	7 144 080	-	-	-	-
1	49 772 280	7 144 100	+	-	-	+
2	49 772 260	7 144 040	-	-	-	-
2	49 772 260	7 144 060	-	-	-	-
2	49 772 260	7 144 080	-	-	-	-
3	49 772 240	7 144 040	+	+	+	-
3	49 772 240	7 144 060	+	+	+	+
3	49 772 240	7 144 080	-	-	-	-
3	49 772 240	7 144 100	+	+	+	+
4	49 772 220	7 144 040	-	-	-	-
4	49 772 220	7 144 060	-	-	-	-
4	49 772 220	7 144 080	+	+	-	-
4	49 772 220	7 144 100	-	-	-	-
5	49 772 200	7 144 040	+	+	-	-
5	49 772 200	7 144 060	-	-	-	-
5	49 772 200	7 144 080	-	-	-	-
5	49 772 200	7 144 100	-	-	-	-
5	49 772 200	7 144 120	-	-	-	-
5	49 772 200	7 144 140	+	+	+	+
5	49 772 200	7 144 160	-	-	-	-
5	49 772 200	7 144 180	+	+	+	+
6	49 772 180	7 144 040	-	-	-	-
6	49 772 180	7 144 060	-	-	-	-
6	49 772 180	7 144 080	+	+	-	-
6	49 772 180	7 144 100	-	-	-	-
6	49 772 180	7 144 120	-	-	-	-
6	49 772 180	7 144 140	+	+	+	-
6	49 772 180	7 144 160	-	-	-	-
6	49 772 180	7 144 180	-	-	-	-
6	49 772 180	7 144 200	-	-	-	-
6	49 772 180	7 144 220	-	+	+	-
7	49 772 160	7 144 040	-	+	+	+
7	49 772 160	7 144 060	-	-	-	-
7	49 772 160	7 144 080	+	+	+	-
7	49 772 160	7 144 100	+	+	-	-
7	49 772 160	7 144 120	+	+	-	-
7	49 772 160	7 144 140	-	-	-	-
7	49 772 160	7 144 160	-	+	-	-
7	49 772 160	7 144 180	+	+	-	-
7	49 772 160	7 144 200	-	-	-	-
7	49 772 160	7 144 220	-	-	-	-

Appendix 1A (cont.).

Transect No.	Easting	Northing	Litter	0-1 m	1-2 m	>2 m
8	49 772 140	7 144 020	-	+	-	-
8	49 772 140	7 144 040	+	+	-	-
8	49 772 140	7 144 060	-	-	-	-
8	49 772 140	7 144 080	+	+	-	-
8	49 772 140	7 144 100	-	-	-	-
8	49 772 140	7 144 120	-	+	-	-
8	49 772 140	7 144 140	-	-	-	-
8	49 772 140	7 144 160	+	-	-	-
8	49 772 140	7 144 180	-	-	+	-
8	49 772 140	7 144 200	+	-	-	-
8	49 772 140	7 144 220	-	-	-	-
9	49 772 120	7 144 020	+	+	-	-
9	49 772 120	7 144 040	+	+	-	-
9	49 772 120	7 144 060	+	-	-	-
9	49 772 120	7 144 080	-	+	-	-
9	49 772 120	7 144 100	-	-	-	-
9	49 772 120	7 144 120	+	+	+	+
9	49 772 120	7 144 140	+	+	+	+
9	49 772 120	7 144 160	-	+	+	+
9	49 772 120	7 144 180	+	+	+	+
9	49 772 120	7 144 200	+	+	+	+
10	49 772 100	7 144 020	+	+	-	-
10	49 772 100	7 144 040	+	+	-	-
10	49 772 100	7 144 060	-	+	-	-
10	49 772 100	7 144 080	-	-	-	-
10	49 772 100	7 144 100	+	+	-	-
10	49 772 100	7 144 120	-	-	-	-
10	49 772 100	7 144 140	-	-	-	-
10	49 772 100	7 144 160	+	+	-	-
10	49 772 100	7 144 180	+	+	+	+
10	49 772 100	7 144 200	-	-	-	-
11	49 772 080	7 144 020	+	+	-	-
11	49 772 080	7 144 040	-	-	-	-
11	49 772 080	7 144 060	+	+	+	-
11	49 772 080	7 144 080	-	-	-	-
11	49 772 080	7 144 100	-	+	-	-
11	49 772 080	7 144 120	-	-	-	-
11	49 772 080	7 144 140	+	+	+	+
11	49 772 080	7 144 160	-	-	-	-
11	49 772 080	7 144 180	+	+	+	-
11	49 772 080	7 144 200	-	-	-	-

Appendix 1A (cont.)

Transect No.	Easting	Northing	Litter	0-1 m	1-2 m	>2 m
12	49 772 060	7 144 000	+	-	+	-
12	49 772 060	7 144 020	+	+	-	-
12	49 772 060	7 144 040	+	+	+	-
12	49 772 060	7 144 060	-	-	-	-
12	49 772 060	7 144 080	+	+	-	-
12	49 772 060	7 144 100	+	+	+	+
12	49 772 060	7 144 120	+	+	-	-
12	49 772 060	7 144 140	-	-	-	-
12	49 772 060	7 144 160	+	+	-	-
12	49 772 060	7 144 180	-	-	-	-
12	49 772 060	7 144 200	-	-	-	-
13	49 772 040	7 144 000	-	-	-	-
13	49 772 040	7 144 020	-	+	-	-
13	49 772 040	7 144 040	+	+	-	-
13	49 772 040	7 144 060	-	-	-	-
13	49 772 040	7 144 080	-	-	-	-
13	49 772 040	7 144 100	+	-	+	+
13	49 772 040	7 144 120	+	+	+	-
13	49 772 040	7 144 140	+	+	+	-
13	49 772 040	7 144 160	-	-	-	-
13	49 772 040	7 144 180	-	-	-	-
14	49 772 020	7 144 000	-	-	-	-
14	49 772 020	7 144 020	+	+	-	-
14	49 772 020	7 144 040	-	-	-	-
14	49 772 020	7 144 060	+	+	+	+
14	49 772 020	7 144 080	-	-	-	-
14	49 772 020	7 144 100	+	-	-	-
14	49 772 020	7 144 120	-	+	-	-
14	49 772 020	7 144 140	-	-	-	-
14	49 772 020	7 144 160	-	-	-	-
14	49 772 020	7 144 180	-	-	-	-
15	49 772 000	7 144 000	-	-	-	-
15	49 772 000	7 144 020	-	-	-	-
15	49 772 000	7 144 040	-	-	-	-
15	49 772 000	7 144 060	-	+	-	-
15	49 772 000	7 144 080	+	+	-	-
15	49 772 000	7 144 100	-	-	-	-
15	49 772 000	7 144 120	-	+	-	-
15	49 772 000	7 144 140	+	+	-	-
15	49 772 000	7 144 160	-	-	-	-
15	49 772 000	7 144 180	-	+	-	-

Appendix 1A (cont.)

Transect No.	Easting	Northing	Litter	0-1 m	1-2 m	>2 m
16	49 771 980	7 144 000	+	+	-	-
16	49 771 980	7 144 020	-	-	-	-
16	49 771 980	7 144 040	-	-	-	-
16	49 771 980	7 144 060	-	+	-	-
16	49 771 980	7 144 080	+	+	-	-
16	49 771 980	7 144 100	-	-	-	-
16	49 771 980	7 144 120	-	+	-	-
16	49 771 980	7 144 140	-	-	-	-
16	49 771 980	7 144 160	-	+	-	-
16	49 771 980	7 144 180	-	-	-	-
17	49 771 960	7 143 980	+	+	+	+
17	49 771 960	7 144 000	-	-	-	-
17	49 771 960	7 144 020	-	-	-	-
17	49 771 960	7 144 040	-	-	-	-
17	49 771 960	7 144 060	-	-	-	-
17	49 771 960	7 144 080	-	+	-	-
17	49 771 960	7 144 100	+	+	-	-
17	49 771 960	7 144 120	-	+	-	-
17	49 771 960	7 144 140	+	+	-	-
17	49 771 960	7 144 160	-	+	-	-
17	49 771 960	7 144 180	-	+	-	-
18	49 771 940	7 143 980	-	-	-	-
18	49 771 940	7 144 000	+	+	+	+
18	49 771 940	7 144 020	-	-	-	-
18	49 771 940	7 144 040	-	-	-	-
18	49 771 940	7 144 060	-	-	-	-
18	49 771 940	7 144 080	-	-	-	-
18	49 771 940	7 144 100	-	-	-	-
18	49 771 940	7 144 120	+	+	-	-
18	49 771 940	7 144 140	+	+	+	-
18	49 771 940	7 144 160	-	-	-	-
			59	73	30	19

Total points: 155

Appendix 1B. South of the Denham-Monkey Mia Road.

Transect No.	Easting	Northing	Litter	0-1 m	1-2 m	>2 m
19	49 771 980	7 143 780	-	-	-	-
19	49 771 980	7 143 800	-	-	-	-
19	49 771 980	7 143 820	+	+	-	-
19	49 771 980	7 143 840	-	+	-	-
19	49 771 980	7 143 860	+	+	-	-
19	49 771 980	7 143 880	-	-	-	-
19	49 771 980	7 143 900	-	-	-	-
19	49 771 980	7 143 920	+	+	-	-
19	49 771 980	7 143 960	-	+	-	-
20	49 772 020	7 143 780	-	-	-	-
20	49 772 020	7 143 800	+	+	+	-
20	49 772 020	7 143 820	-	-	-	-
20	49 772 020	7 143 840	-	+	-	-
20	49 772 020	7 143 860	-	-	-	-
20	49 772 020	7 143 880	-	-	-	-
20	49 772 020	7 143 900	+	+	+	-
20	49 772 020	7 143 920	-	-	-	-
20	49 772 020	7 143 940	-	-	-	-
20	49 772 020	7 143 960	-	-	-	-
21	49 772 060	7 143 800	-	-	-	-
21	49 772 060	7 143 820	+	+	+	+
21	49 772 060	7 143 840	+	+	-	-
21	49 772 060	7 143 860	-	-	-	-
21	49 772 060	7 143 880	-	-	-	-
21	49 772 060	7 143 900	-	-	-	-
21	49 772 060	7 143 920	-	-	-	-
21	49 772 060	7 143 940	+	+	+	+
21	49 772 060	7 143 960	+	+	-	-
21	49 772 060	7 143 980	+	-	-	-
			10	12	4	2

Total points 29

APPENDIX TWO. Locations of all records of Thick-billed Grasswrens.

Easting	Northing	Group code	Group size
772 528	7 144 156	1	1+
772 556	7 144 178	1	
772 552	7 144 208	1	
772 621	7 144 055	1	
772 569	7 144 149	2	3
772 582	7 144 144	2	
772 586	7 144 142	2	
772 617	7 144 134	3	2
772 427	7 144 103	4	3
772 435	7 144 090	4	
772 450	7 144 056	4	
772 453	7 144 107	4	
772 044	7 144 024	5	3
772 058	7 144 135	5	
772 107	7 144 206	5	
772 086	7 144 182	5	
772 110	7 144 016	5	
772 144	7 144 096	5	
772 177	7 144 082	5	
772 177	7 144 041	5	
772 203	7 144 128	5	
772 250	7 144 065	5	
772 204	7 144 089	5	
772 214	7 144 067	5	
772 215	7 144 102	5	
772 273	7 144 077	5	
771 930	7 144 052	6	2
771 942	7 143 929	6	
771 957	7 144 010	6	
771 947	7 143 992	6	
771 968	7 143 984	6	
771 978	7 143 936	6	
772 010	7 143 954	6	
772 060	7 143 940	6	
772 112	7 143 908	7	1+
772 142	7 143 884	7	
772 327	7 143 784	7	
771 753	7 143 951	8	2
771 858	7 143 728	9	2
771 950	7 143 714	9	
772 078	7 143 696	10	1+
772 255	7 143 742	11	3
772 350	7 143 800	12	3
772 160	7 143 716	12	
771 805	7 143 743	13	1+
772 615	7 143 725	14	2

APPENDIX THREE. Locations of all records of other bird species of interest.

Southern Scrub-robin

Easting	Northing	Group size
772 142	7 143 884	1
772 177	7 144 107	1
771 920	7 144 140	1
772 041	7 143 998	1
771 959	7 144 130	1
771 985	7 143 800	2
772 126	7 143 668	1
771 850	7 143 546	1
771 950	7 143 714	1
772 168	7 143 721	1
772 615	7 143 725	1

Chiming Wedgebill

Easting	Northing	Group size
772 105	7 143 628	1
771 805	7 143 743	1
771 950	7 143 714	2
772 035	7 143 672	1
772 168	7 143 721	1

White-browed Babbler

Easting	Northing	Group size
772 142	7 143 884	4
772 635	7 144 195	4
772 140	7 144 169	2 old nests
772 105	7 144 006	3
771 998	7 143 860	2+
771 967	7 143 985	3+
772 126	7 143 668	3+
772 105	7 143 628	3+
772 500	7 143 600	1+

White-winged Fairy-wren

Easting	Northing	Group size
772 182	7 144 027	2
771 942	7 143 929	2
772 155	7 143 785	1
772 087	7 143 881	1
772 137	7 144 047	1+
771 998	7 143 860	2+

Appendix 3 (cont.)

White-browed Scrubwren

Easting	Northing	Group size
771 932	7 144 131	1+
772 049	7 143 960	1
772 055	7 143 876	2
772 552	7 144 208	2
772 649	7 144 162	1
772 539	7 144 083	1
772 564	7 144 167	1
772 369	7 144 066	1+
772 246	7 144 128	3
771 921	7 144 007	1
772 168	7 144 108	1
771 982	7 143 929	2
772 087	7 143 881	1
772 310	7 143 988	2
772 412	7 144 020	2
772 393	7 144 202	1
772 582	7 144 144	2
772 435	7 144 090	2
772 324	7 144 051	2
772 249	7 144 034	1
772 140	7 144 116	2
772 137	7 144 047	2
771 919	7 144 150	1
771 947	7 143 937	1
772 112	7 143 908	2
772 277	7 144 007	2
772 203	7 144 128	2
771 783	7 144 014	1+
772 255	7 143 742	1
772 462	7 143 780	1+
771 718	7 143 555	1+
772 168	7 143 721	1+
772 650	7 143 590	1+

Appendix 3 (cont.)

Variegated Fairy-wren

Easting	Northing	Group size
772 062	7 144 130	1+
772 177	7 144 107	1+
772 582	7 144 144	3
772 435	7 144 090	2
772 324	7 144 051	3
772 137	7 144 047	2
772 105	7 144 006	2
771 947	7 143 937	2
772 165	7 143 872	3
772 277	7 144 007	2
771 696	7 143 982	1
772 255	7 143 742	1+
772 462	7 143 780	2+
772 126	7 143 668	2+
772 035	7 143 672	1+
772 500	7143 600	2+

APPENDIX D

Letter of Support: Shark Bay Dolphin Research Project

GEORGETOWN UNIVERSITY

Department of Biology

Janet Mann, PhD

Mr. Martin Bowman, Director
Bowman Bishaw Gorham
PO Box 465
Subiaco, WA 6904 Australia

28-Feb-04

Dear Mr. Bowman,

Since the Monkey Mia Dolphin Resort was purchased in 1989, we (the Shark Bay Dolphin Research Project) have been extremely pleased with the level of communication, logistical and financial help to researchers, and commitment to dolphin welfare shown by the Resort. I have been studying the Monkey Mia- Shark Bay dolphins since 1988 and currently co-direct the Shark Bay Dolphin Research Project (SBDRP) with Dr. Richard Connor. I manage the basic long-term data on the dolphin population that over a dozen international investigators from Australia, North America and Europe contribute to annually.

The SBDRP has grown and gained international recognition since it was established in 1984, with over 40 peer-reviewed scientific publications, several books, and over a hundred conference presentations. We reliably receive competitive sources of external grant funding and Monkey Mia is known as the "Gombe" of dolphin research (in reference to Jane Goodall's famous chimpanzee research site). The Monkey Mia Dolphin Resort has unquestionably made a substantial contribution to this endeavor. In addition to basic support of the research by consistently providing free power and rent to the research caravans, they have also provided caravan and office space and more importantly, always helped out when we had concerns about dolphin welfare. In addition, Graeme Robertson donated 15k in matching funds to help us renovate our research catamaran *Nortrek*, when she was long overdue for an overhaul. When the bill went 10k over what we projected, he loaned us the funds and allowed us to sell postcards for the Foundation (see www.monkeymiadolphins.org) to repay our debt (at no interest). The Monkey Mia Dolphin Resort helped us produce and sell postcards to benefit the research and they helped us establish the Dolphins of Monkey Mia Research Foundation in the first place. By allowing us to sell postcards to benefit the Foundation, the Resort loses profits from their own postcard sales.

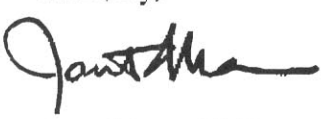
In addition to these major sources of support, the Resort has sustained us in other ways. In 1990 when the park was under reconstruction, we were the only people allowed to stay at Monkey Mia besides the manager and his wife. This allowed us to continue our research uninterrupted. In 1994, when it became clear that the mortality of calves born to the Monkey Mia "beach" dolphins was twice that of calves born to non-provisioned

females (those who don't regularly visit the beach and are not fed), the researchers sounded the alarm, but the Resort fully supported our efforts, even though the publicity of "dead calves at Monkey Mia" was not in their interest, the long-term survival of those calves is in their interest. At the time, one of the calves, Finnick, was also being fed and had become emaciated and isolated from other dolphins. The researchers decided it was time to intervene and bring a veterinarian from Underwater World to see what might be wrong with Finnick. The Resort immediately offered to pay for the veterinarian's flight, time and cover all expenses. The Resort supported the changes in feeding practices recommended in Dr. Wilson's 1994 Report to CALM, even though it restricted the amount of fish fed to the dolphins. Again, most tour operators would focus on the quick dollar, rather than the long-term health and survival of the dolphin population.

The Resort initiated bi-weekly talks, first given by the Resort naturalist and then by the researchers. These talks are about the wildlife and conservation values of the area. We have been happy to give these talks both as a thank-you to the Resort for their help, and because it enhances the visitor's experience. There is nothing commercial about these talks and we do no promotions for the Resort. In other words, the Resort has always encouraged us to share our information with the public, be open about our findings and the implications those findings have for management and conservation of the area.

We maintain our independence from the Resort, but I am more than delighted to write this letter because over the last 15 years, they have been consistently supportive of the research and preservation of Red Cliff Bay. We don't agree 100% on every issue, but they have always been interested in our opinion, taken it very seriously and been concerned about how human activities might affect the dolphins and other wildlife in the vicinity. The Resort has demonstrated its long-term commitment to Shark Bay and maintaining its outstanding features. I have not reviewed their specific plans for expansion and cannot offer an opinion in that regard. This letter documents their past behaviour with regard to nature conservation and specifically the dolphins, which has been extremely positive. They have been unfailingly supportive of the dolphin research in many more ways than I've been able to show in this brief letter. Please do not hesitate to contact me if I can provide more information.

Sincerely,



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APPENDIX E

Native Title Determination

NATIONAL NATIVE TITLE TRIBUNAL
FACSIMILE

Telephone: (08) 9268 7381 Facsimile: (08) 9221 7318 Email: katies@nntt.gov.au

To:

The Malgana Shark Bay People's Application
C/- Yamatji Land and Sea Council
Mr Ritter
Fax: (08) 9225 4633

Monkey Mia Dolphin Resort Pty Ltd
C/- Freehills, Barristers & Solicitors
Mr Jagger
Fax: (08) 9211 7245

Crown Solicitor's Office
Ms Howlett
Fax: (08) 9481 7169

Department of Land Administration
Fax: (08) 9273 7052

From: Xanthe White
Case Manager's Assistant

Date: 22 June, 2001

Subject: **Determination**
WF01/2 Inquiry into Expedited Procedure Objection Application: The Malgana Shark Bay People's Application (WC98/17) & Monkey Mia Dolphin Resort Pty Ltd (DOLA ref no. 975250 – Compulsory Acquisition)

Number of pages for transmission (including this one): 17

Message:

Please find to follow the Determination handed down by Deputy President Sumner.

All Tribunal records have been updated to reflect this Determination and the Tribunal now considers this matter finalised.

Please contact the Case Manager for this matter, Katie Stride, on (08) 9268 7381 if you require further information or assistance.

Yours sincerely

NATIONAL NATIVE TITLE TRIBUNAL

Application No: WF01/2

IN THE MATTER of the *Native Title Act* 1993 (Cth)

- and -

IN THE MATTER of an inquiry into a Future Act Determination Application

Monkey Mia Dolphin Resort Pty Ltd (Applicant/grantee party)
-and-
The State of Western Australia (Government party)
- and -
Albert Darby Winder and others (native title party)

FUTURE ACT DETERMINATION

Tribunal: The Hon C J Sumner, Deputy President
Place: Perth
Date: 22 June 2001

Catchwords: Native title – future act – application for a determination in relation to the taking of native title rights and interests – compulsory acquisition under the *Land Administration Act* 1997 (WA) – evidence of agreement between the parties – consent determination – Tribunal to be satisfied that informed consent of parties has been given – normally statement by legal representatives is sufficient evidence of consent – 'the native title party' is all of the registered native title claimants acting collectively – individual claimants not entitled to separate representation – guidelines for making of consent determinations – act may be done with a condition.

Legislation: *Native Title Act* 1993 (Cth) ss 24MD(2), 25(4), 29(1), 31(1)(b), 38, 39, 62A, 109, 141, 142, 143, 202
Land Administration Act 1997 (WA) ss 161, 165(1), 170

Cases: *Mabo v Queensland No.2* (1991-1992) 175 CLR 1
Western Australia v Thomas ('Waljen') 133 FLR 124
Western Australia v Ward [2000] 170 ALR 159
Evans v Western Australia (1997) 77 FCR 193
Risk v National Native Title Tribunal [2000] FCA 1589
Tilmouth v Northern Territory D6025 of 2001, O'Loughlin J, unreported

Western Australia/Ted Coomanoo Evans & Ors and Quinton Tucker & Ors/Townson Holdings NL, NNTT WF98/6, Hon C J Sumner, 11 December 1998

Western Australia/Teddy Roberts & Ors/John Skeffington & Ian Duggan, NNTT WF98/274, Hon C J Sumner, 11 December 1998

Western Australia/Rita Dempster & Ors/Paul Shiner & Ors, NNTT WF98/194, Professor Douglas Williamson, RFD QC, 3 June 1999

Dale Gary Graham & Ors v Western Australia, NNTT WF98/275 and WF98/279, Hon E M Franklyn QC, 28 June 1999

Yallourn Energy Pty Ltd/Terence Ernest Campbell Hood & Ors/Victoria, NNTT VF99/1, Hon C J Sumner, 17 September 1999

WMC Resources Ltd/Western Australia/Richard Evans (Koara people), NNTT WF99/4, Hon C J Sumner, 23 December 1999

Jeffrey James & Ors/Western Australia/Straits Exploration (Australia) Pty Ltd, NNTT WF00/6, Hon C J Sumner, 30 October 2000

Placer (Granny Smith) Pty Ltd and Granny Smith Mines Limited/Western Australia/Ron Harrington-Smith & Ors (Wongatha people), NNTT WF99/5, Hon C J Sumner, 16 February 2000 and 24 February 2000

Words & Phrases: 'native title party'

REASONS FOR DETERMINATION

Background

[1] On 17 June 1998, the State of Western Australia (the Government party) gave notice in accordance with s 170 of the *Land Administration Act* 1997 (WA) and s 29(1) of the *Native Title Act* 1993 (Cth) (the NTA) that it proposed to take all interests including native title rights and interests in land specified in the notice. The land is situated in the Shire of Shark Bay in Western Australia and comprises the land described as:

(i) Edel Location 109 being dedicated road, Volume 3110 Folio 476, an area of 8974 square metres; and

(ii) part Edel Location 80 being Reserve 1686 for 'Recreation', Volume 3162 Folio 779, an area of 2.3596 hectares. Reserve 1686 is a 'C' Class Reserve vested in the Department of Conservation and Land Management and Shire of Shark Bay jointly and is designated as being for 'recreation' purposes but there is no power to lease any part of the Reserve.

The land taken will be included into Edel Location 67-Reserve 40727. The care control and management of the land will be placed in the Shire of Shark Bay with power to lease the whole or portions of the Reserve for periods up to 99 years. Monkey Mia Dolphin Resort Pty Ltd (the grantee party/Monkey Mia) is the lessee of Reserve 40727 which is currently used for a Caravan Park, Chalets and Camping. It is proposed that the grantee party will be the lessee and developer over the expanded Reserve 40727. The enlarged Reserve will enable the expansion of existing tourist accommodation and facilities currently operated by Monkey Mia. The proposed tourist development (the Resort) will comprise a hotel, bungalows, backpackers accommodation, motel units, caravan lots, a camping area and associated infrastructure and support facilities including shop, cafe, restaurant and function room.

The taking of the land pursuant to s 165 of the *Land Administration Act* is a compulsory acquisition of native title rights and interests covered by s 26(1) of the NTA and is a future act to which the right to negotiate provisions of the NTA apply (Subdivision P, Division 3, Part 2 (ss 25-44 NTA)). Unless the provision of the Subdivision are complied with the act will be invalid to the extent that it affects native title (s 25(4) NTA).

[2] The Malgana Shark Bay People's Application for determination of native title was originally made and placed on the Register of Native Title Claims on 30 March 1998. The claim was subsequently registered under the new registration provisions of the NTA on 18 August 1999. The following persons are the applicants on the claim and hence the registered native title claimants and 'the native title party' in respect of this application: Mr Albert Darby Winder, Mr Allen Mitchell, Mr Anthony James Bellotti, Mr Anthony Thomas Bellotti, Mr Charles Mitchell, Mr Gavin Charles Poland, Mr Gavin Clyde Oakely, Mr Glen William Hoult, Mr Greg Edward Mallard, Mr Harold Richard Hoult, Mr Howard Cock, Mr John Winder, Mr Laurence James Mitchell Bellotti, Mr Leslie John Craig Oakley, Mr Ralph Reginald Wear, Mr Revel Oakley, Mr Richard Oakely, Mr Rodney Bellotti, Mr Roy Bellotti, Mr Thomas Charles Poland, Ms Ada Mary Fossa, Ms Christine Maree Wear, Ms Elizabeth Margot Mallard (Mitchell), Ms Francis Sharon Oxenham, Ms Gail Bellotti, Ms Jillian Georgina Oakley, Ms Lorraine Whitby, Ms Maria Bernadette Poland, Ms Marika Kate Hoult, Ms Marion Joyce Oakley, Ms Mona Jessie Oakley, Ms Nelly Cocks, Ms Nora Fossa, Ms Phyllis Ugle McMahon, Ms Rhonda Mitchell, Ms Rosie Wear, Ms Sandra Bellotti, Ms Sylvia Drage.

[3] On 24 May 2001, the grantee party applied under s 35 of the NTA for a future act determination in relation to the taking of interests in the land specified in the s 29 notice. On 30 May 2001, the Tribunal convened a preliminary conference to give directions to the parties for the production of contentions and documents in preparation for an inquiry. The Tribunal was informed that agreement had been reached between the parties about the proposal but the matter could not be finalised because two of the 38 registered native title claimants had not signed the agreement between Monkey Mia and the native title party (the ancillary agreement) nor signed an agreement of the kind mentioned in para 31(1)(b) of the NTA (the State Deed) which is required to be signed by all negotiation parties and lodged with the Tribunal before the arbitral proceedings can be terminated. The Government party has a policy that it will not execute a State Deed unless all the registered native title claimants have also done so. Discussion ensued about whether the Tribunal should make a consent determination that the act may be done leaving the relationship between Monkey Mia and the native title party to be governed by the ancillary agreement. The preliminary conference was adjourned to enable parties to give consideration to this option and for the Tribunal to indicate whether it was prepared to make a consent determination of this kind in these circumstances.

[4] At a reconvened preliminary conference on 13 June 2001 the grantee party, with the consent of the other parties, proposed that the Tribunal make a determination that the act may be done subject to a condition that the grantee party execute and be bound by the ancillary agreement. In support of its proposal it tendered a copy of the ancillary agreement. The grantee party submitted that the agreement provided sufficient evidence of the factors in s 39(1) of the NTA to enable the Tribunal to make a determination in the terms sought. Given the refusal of two of the 38 to sign the ancillary agreement, the grantee party proposed that the Tribunal not rely exclusively on the consent of the parties.

[5] The native title party was represented by Mr David Ritter, Principal Legal Officer of the Yamatji Land and Sea Council, the recognised representative Aboriginal/Torres Strait Islander body appointed under the NTA, the grantee party by Mr Ken Jagger of Freehills, Barristers and Solicitors, and the Government party by Ms Rhonda Howlett of the Crown Solicitor's Office.

The law

[6] The centrally relevant provisions of the NTA are:

> **'38 Kinds of arbitral body determinations**
>
> (1) Except where section 37 applies, the arbitral body must make one of the following determinations:
>
> (a) a determination that the act must not be done;
> (b) a determination that the act may be done;
> (c) a determination that the act may be done subject to conditions to be complied with by any of the parties.
>
> *Determinations may cover other matters*
>
> (1A) A determination may, with the agreement of the negotiation parties, provide that a particular matter that:
>
> (a) is not reasonably capable of being determined when the determination is made; and
> (b) is not directly relevant to the doing of the act;
>
> is to be the subject of further negotiations or to be determined in a specified manner.
>
> Example: The arbitral body could determine that a mining lease may be granted subject to site clearance procedures to be determined by a third person.
>
> *Matters to be determined by arbitration*
>
> (1B) If:
>
> (a) the manner specified is arbitration (other than by the arbitral body); and
> (b) the negotiation parties do not agree about the manner in which the arbitration is to take place;
>
> the arbitral body must determine the matter at an appropriate time.

Profit-sharing conditions not to be determined

(2) The arbitral body must not determine a condition under paragraph (1)(c) that has the effect that native title parties are to be entitled to payments worked out by reference to:

(a) the amount of profits made; or
(b) any income derived; or
(c) any things produced;

by any grantee party as a result of doing anything in relation to the land or waters concerned after the act is done.

39 Criteria for making arbitral body determinations

(1) In making its determination, the arbitral body must take into account the following:

(a) the effect of the act on:

(i) the enjoyment by the native title parties of their registered native title rights and interests; and
(ii) the way of life, culture and traditions of any of those parties; and
(iii) the development of the social, cultural and economic structures of any of those parties; and
(iv) the freedom of access by any of those parties to the land or waters concerned and their freedom to carry out rites, ceremonies or other activities of cultural significance on the land or waters in accordance with their traditions; and
(v) any area or site, on the land or waters concerned, of particular significance to the native title parties in accordance with their traditions;

(b) the interests, proposals, opinions or wishes of the native title parties in relation to the management, use or control of land or waters in relation to which there are registered native title rights and interests, of the native title parties, that will be affected by the act;

(c) the economic or other significance of the act to Australia, the State or Territory concerned, the area in which the land or waters concerned are located and Aboriginal peoples and Torres Strait Islanders who live in that area;

(e) any public interest in the doing of the act;

(f) any other matter that the arbitral body considers relevant.

Existing non-native title interests etc.

(2) In determining the effect of the act as mentioned in paragraph (1)(a), the arbitral body must take into account the nature and extent of:

(a) existing non-native title rights and interests in relation to the land or waters concerned; and
(b) existing use of the land or waters concerned by persons other than the native title parties.

Laws protecting sites of significance etc. not affected

(3) Taking into account the effect of the act on areas or sites mentioned in subparagraph (1)(a)(v) does not affect the operation of any law of the Commonwealth, a State or Territory for the preservation or protection of those areas or sites.

Agreements to be given effect

(4) Before making its determination, the arbitral body must ascertain whether there are any issues relevant to its determination on which the negotiation parties agree. If there are, and all of the negotiation parties consent, then, in making its determination, the arbitral body:

(a) must take that agreement into account; and
(b) need not take into account the matters mentioned in subsection (1), to the extent that the matters relate to those issues.

The Tribunal's task is a discretionary one that involves weighing the criteria in s 39 on the basis of the evidence before it to decide which of the determinations provided for in s 38 is appropriate in the circumstances. The Tribunal must have regard to any evidence relating to the criteria and consider the evidence of what the Government and grantee parties propose to do, and how that will effect the matters of interest to the native title party specified in s 39(1)(a).

The evidence

[7] The Tribunal has before it evidence relating to the following:

(i) the nature of the act which the Government party proposes to do and the proposals of the grantee party once the interests in land have been acquired and a lease granted to it by the Shire of Shark Bay;

(ii) an extract from the Register of Native Title Claims which sets out the native title rights and interests claimed by the native title party and the area over which they are claimed. The area of the claim is extensive;

(iii) a copy of the ancillary agreement entitled 'Malgana Agreement Monkey Mia – Malgana Claimants and Monkey Mia Dolphin Resort Pty Ltd ACN 009 342 054' prepared by Freehill, Hollingdale & Page, Barristers and Solicitors (now Freehills); and

(iv) the consent of the parties to a determination that the act may be done with a condition conveyed to the Tribunal by their legal representatives and subsequently confirmed by them in writing.

Section 39(1)(a)(i) – enjoyment of registered native title rights and interests

[8] The proposed future act is to take all interests in the land held by persons other than the Crown pursuant to s 165(1) of the *Land Administration Act* 1997 (see also s 161). The interests to be taken include the native title rights and interests. The act is the compulsory acquisition of any native title rights and interests under the law of a State and extinguishes the whole of the native title rights and interests which exist over the land (s 24MD(2) NTA). Apart from the Register of Native Title Claims there is no evidence of the native title rights and interests which exist over the land. For the purposes of this inquiry I must assume the existence of the native title rights and interests as registered and that they could be affected.

However, s 39(1)(a)(i) talks of the effect of the act on the 'enjoyment' of the registered native title rights and interests and the Tribunal must consider any evidence of the exercise or enjoyment of the native title rights claimed by the native title party (*WMC Resources Ltd/Western Australia/Evans*, NNTT WF99/4, Hon C J Sumner, 23 December 1999 at p10-11). It is ordinarily the responsibility of the native title party to produce this evidence (*Western Australia v Thomas ('Waljen')* 133 FLR 124 at 162). The limited objective facts suggest that native title rights are not enjoyed over the land to be acquired. There is no evidence of what specific activities are currently conducted on Reserve 1686 but the fact that it is a 'C' Class Reserve for recreation which adjoins the current tourist facility and a relatively small area suggests that native title rights and interests are not enjoyed over it. The area generally is serviced by a road, part of which is also to be acquired. No point has been taken by any party that this road is of a type which extinguishes native title (*Fourmile v Selpam & Ors* (1998) 152 ALR 294) but even if native title has not been extinguished, it is highly unlikely that native title rights are enjoyed over it (again it is a relatively small area). In these circumstances and taking into account that the native title party, through its solicitors at the Yamatji Land and Sea Council, have not produced evidence of the exercise of native title rights and interests over the land I am entitled to infer that the native title rights and interests are not enjoyed in any practical sense over the area of land to be acquired. The compulsory acquisition will obviously preclude any future enjoyment of them but in the circumstances no great weight can be given this fact. I also take into account that the area to be taken is less than 3 hectares in a large claim area.

Section 39 (1)(a)(ii) - way of life, culture and traditions
Section 39(1)(a)(iii) - development of social, cultural and economic structures

[9] There is no evidence of any negative effects of the proposed acts on either of these criteria. On the other hand the ancillary agreement contains provisions which if fulfilled will be of benefit to the native title party. In particular:

(i) on the granting of the lease by the Shire of Shark Bay to Monkey Mia, Monkey Mia will make available to the native title party a building to enable the native title party to operate an Aboriginal Cultural Centre for the benefit of the Malgana people by way of a business which sells Aboriginal art and artefacts and promotes the traditions of the Malgana people. The Cultural Centre building will comprise an area of approximately 64 square metres and be located near the proposed main reception centre of the Resort (unless otherwise agreed by the parties). It will be fitted out by

the grantee party and provided with electricity and water to meet the reasonable requirements of the business. It will be built when the new reception is built for the Resort. The native title party will have the exclusive use of the Cultural Centre building from the date it is ready for occupation during the term of the lease from the Shire to Monkey Mia (unless Monkey Mia terminates the native title party's right to use the building for failure to comply with their obligations under the agreement). The native title party is to pay to Monkey Mia one fifth of the net income derived from the business operated at the Cultural Centre building and the balance is to be retained by the native title party. Monkey Mia will include references to the Cultural Centre in its promotional material for the Resort and permit such material to be displayed in its main reception area. Monkey Mia will keep the Cultural Centre building in good repair, order and condition.

(ii) the grantee party will contribute up to $5,000 towards airfares and costs for the native title party to prepare a business plan to support an application to the Aboriginal and Torres Strait Islander Commission or other reputable financial institutions for working capital to establish and operate the business. It will also provide reasonable assistance in kind to help the application.

(iii) the native title party intends to apply for a lease of land within the Shark Bay Shire proposed aquaculture precinct for aquaculture purposes. Monkey Mia undertakes to use its reasonable endeavours to assist the native title party to secure a lease of that land, including by writing to the Minister indicating its strong support for the application and saying that the activities of the native title party on the land will be beneficial for the Shark Bay pearling industry, the Resort and the Malgana people.

(iv) Monkey Mia also undertakes to provide ongoing training in all facets of the hospitality industry for the benefit of Aboriginal youth. This involves the provision of the opportunity for two Aboriginal persons to be trained each year in the hospitality industry by following an agreed 52 week program. During the traineeship the students will be employed by Monkey Mia and paid at an agreed rate.

(v) Monkey Mia undertakes to notify the native title party of any vacancies which exist for employment with Monkey Mia and will meet with the native title party to discuss progress on the training program and ways by which the program may be improved for the benefit of Aboriginal youth.

(vi) the agreement makes provision for the native title party and Monkey Mia to appoint three persons each to act as representatives in connection with the agreement which representatives are to make certain decisions required by the agreement.

(vii) there is provision for Monkey Mia to assign a whole or any part of its interest in the lease or under the agreement but the assignee must enter into a deed of covenant to be bound by the terms of the agreement.

Section 39 (1)(a)(iv) - freedom of access – freedom to carry out rites, ceremonies and other activities

[10] There is no evidence of any current access by the native title party to the land for the purpose of conducting any rites or ceremonies or for any other purpose. The agreement guarantees that all employees and other persons engaged in the running of the Cultural Centre business will have access to the Cultural Centre building subject to complying with directions of Monkey Mia concerning the health, safety and security of other persons at the Resort, the enjoyment of the Resort by its guests and subject to appropriate standards of behaviour in a first class resort.

Section 39(1)(a)(b) – sites of particular significance

[11] There is no evidence of any sites of particular significance to the native title party that will be affected by the act.

Section 39(1)(b) – interests, proposals, opinions or wishes of the native title party

[12] The native title party consents to the determination and condition and their interests will be advanced if and when the Aboriginal Cultural Centre is established.

Section 39(1)(c) - economic or other significance

[13] There is no specific evidence before me of the economic or other significance of the proposed resort development but it is apparent from the agreement that Monkey Mia intends to upgrade their existing facilities to a first class resort. I am entitled to infer that this will involve capital expenditure on building and other infrastructure works and ongoing economic benefits to the grantee party and its employees. The agreement provides that some of these employees will be Aboriginal people and the native title party claim group will benefit from a successful business venture.

Section 39(1)(e) - public interest

[14] The proposed development has the support of the Shire of Shark Bay and there is no evidence to suggest that the upgrading of Monkey Mia Resort is other than in the general public interest.

Section 39(1)(f) – any other relevant matter

[15] The Government party pointed out that Clause 2.2 of the ancillary agreement requires the native title party and Monkey Mia to execute a State Deed contemporaneously with or as soon as practicable after the execution of the ancillary agreement and that the Government party would not sign such a State Deed until all 38 of the registered native title claimants have signed. The native title party and grantee party advised the Tribunal that they would not seek to enforce Clause 2.2 but that the rest of the rights and obligations contained in the agreement imposed on them would remain.

Conclusion

[16] The Tribunal is satisfied on the basis of the evidence that it is appropriate to make a determination in the terms consented to by all parties. The Tribunal has not relied solely on the consent given but has taken into account the ancillary agreement entered into between the native title party and Monkey Mia and the benefits which will flow to the native title party when and if it is fully implemented. It is unlikely that native title rights and interests are enjoyed on the land and little weight can be given to the effect of the act on them. Considerable weight has been given to the benefits to the native title party which should flow from the proposal as well as to the consent of the parties.

With respect to the consent of the native title party, I am satisfied that I can rely on it even though two of 38 registered native title claimants have declined to sign an agreement (see *Placer (Granny Smith) Pty Ltd and Granny Smith Mines Limited/Western Australia/Ron Harrington-Smith & Ors (Wongatha people)*, NNTT WF99/5, Hon C J Sumner, 16 February 2000 and 24 February 2000 and discussion below). The Yamatji Land and Sea Council is satisfied that the native title party collectively consents to the determination and I have no difficulty on the facts of this case in accepting that the consent has been properly given.

The Tribunal's approach to consent determinations

[17] The Tribunal is aware that interest has been expressed by a number of parties in the use of consent determinations as a means of finalising agreements following negotiations under s 31(1)(b) of the NTA. Practical problems have been encountered where collectively the native title party has entered into an agreement but been unable to obtain the signatures of all registered native title claimants either to an ancillary agreement or State Deed. In other cases the State Deed has not been executed in a way satisfactory to the Government party, for instance where a witness to a signature was a fellow claimant. Sometimes considerable delays result because of difficulties in finding individual registered claimants who may live in remote localities or be on country away from centres of population. The cost of obtaining signatures in these circumstances is also said to be a problem. The present matter provides one example of the difficulties sometimes encountered in finalising agreements under the right to negotiate. It is therefore important to restate the Tribunal's position with respect to consent determinations in s 35 applications and to issue some guidelines for the manner in which they will be handled in future. In this matter the Tribunal partially relied on the consent of the parties (including the native title party) but also had other evidence before it to support its determination. This is not always the case. For instance, the parties may be reluctant to make the details of an ancillary agreement available to the Tribunal for confidentiality reasons and not feel that a non-disclosure order under s 155 of the NTA would suffice to protect their interests.

[18] The law and Tribunal practice in relation to consent determinations can be summarised as follows.

(i) The Tribunal has the power and will make a determination with the consent of all parties provided it is appropriate to do so in the circumstances.

In *Western Australia/Ted Coomanoo Evans & Ors and Quinton Tucker & Ors/Townson Holdings NL*, NNTT WF98/6, Hon C J Sumner, 11 December 1998; *Wester Australia/Teddy Roberts & Ors/John Skeffington & Ian Duggan*, NNTT WF98/274, Hon C J Sumner, 11 December 1998; and *Western Australia/Rita Dempster & Ors/Paul Shiner & Ors*, NNTT WF98/194, Professor Douglas Williamson, RFD QC, 3 June 1999, the Tribunal made a determination by consent of the parties that the act may be done without conditions. The native title party was content to rely on the ancillary agreement which it had entered into with the grantee party. In other matters the Tribunal has made a consent determination with

agreed conditions (*Dale Gary Graham & Ors v Western Australia*, NNTT WF98/275 and WF98/279, Hon E M Franklyn QC, 28 June 1999; *Yallourn Energy Pty Ltd/Terence Ernest Campbell Hood & Ors/Victoria*, NNTT VF99/1, Hon C J Sumner, 17 September 1999; and *Placer (Granny Smith) Pty Ltd and Granny Smith Mines Limited/Western Australia/Ron Harrington-Smith & Ors*, NNTT WF99/5, Hon C J Sumner, 16 February 2000).

The factors which led the Tribunal to conclude that it had power to make a determination by consent were:

- the parties are given an important role in right to negotiate inquiries and ordinarily it will be for the parties to produce evidence and not for the Tribunal to seek it out (ss 141(2), 142, 143 NTA) (see analysis in *Western Australia v Thomas ('Waljen')* 133 FLR 124 at 154-163);
- the power is consistent with the requirement in s 109(1) of the NTA for the Tribunal to carry out its functions in a fair, just, economical, informal and prompt way;
- s 39(1)(f) of the NTA requires the Tribunal to take into account any matter which it considers relevant and the consent of parties is one such matter; and
- s 39(4) introduced by the amendments to the NTA in 1998 which requires any agreement between the parties to be taken into account.

(ii) The Tribunal will ordinarily be prepared to act on the consent of the parties as conveyed by their solicitors but there may be circumstances where further information about whether informed consent has been given is required.

In WF98/274 where 93 registered native title claimants were involved the Tribunal received affidavit evidence from four of them deposing to their authority under customary law to enter into the agreement.

In WF98/275 and WF98/279 the Tribunal said that while there may be circumstances that would make it inappropriate to act on the bare request of the parties such as where they were unrepresented, it could see no need to look beyond the consent of the parties where the parties were so represented.

In *Jeffrey James & Ors/Western Australia/Straits Exploration (Australia) Pty Ltd*, NNTT WF00/6, Hon C J Sumner, 30 October 2000 the Tribunal made a consent determination based on the consent of the native title party and Government party conveyed by their legal representatives. The native title party lodged the s 35 application together with doouments consenting to the determination signed by the grantee party and solicitors for the other parties. No further evidence was tendered or required by the Tribunal.

(iii) In some matters the Tribunal has relied on other evidence before it to confirm that a consent determination was appropriate.

In WF98/194 Tribunal relied on the fact that the parties were represented by experienced legal practitioners, that it had received a considerable body of oral and other evidence and submissions which led it to the conclusion that there was nothing concerning the interests of any party or the public interest that precluded it acting on the consent of the parties.

In VF99/1, the Tribunal pointed to the fact that there had been extensive negotiations, most of the evidence had been heard and supported a determination that the act may be done, and that the parties had been represented by experienced legal practitioners.

(iv) The Tribunal can only impose conditions by consent which are within its power (WF98/274 at 3 and see generally *Evans v Western Australia* (1997) 77 FCR 193).

(v) where conditions are to be imposed the Tribunal may suggest amendments to them. In WF99/5 the Tribunal was concerned that there would be inadequate protection for the native title party were the mining lease to be assigned.

[19] One of the significant issues which has arisen (as it did in this case) is whether the Tribunal can make a consent determination where some of the registered native title claimants decline to give their consent. In WF99/5 the Tribunal made a determination even though one of 12 registered native title claimants did not consent. The Tribunal decided that a 'native title party' is not each registered native title claimant on the same claim but is the registered native title claimants acting collectively as representatives and agents for the claim group (s 62A NTA) and that each individual registered native title claimant is not entitled to separate representation in a right to negotiate inquiry (*Placer (Granny Smith) Pty Ltd and Granny Smith Mines Limited/Western Australia/Ron Harrington-Smith & Ors (Wongatha people)*, NNTT WF99/5, Hon C J Sumner, 24 February 2000 at 5-11). It also follows from this decision that the Tribunal will be prepared to act on the consent given by the native title

party collectively unless there is some credible suggestion that this is not appropriate. Lawyers acting for the native title party should normally be in a position to advise the Tribunal that the consent has properly been given, based on the established decision making processes of the native title claim group. The fact that a representative Aboriginal and Torres Strait Islander body is involved in assisting the native title party (s 202 NTA) would add weight to a decision that a consent determination is appropriate.

[20] In WF99/5 (at 11) the Tribunal said that its decision was supported by the fact that native title is generally considered to be held communally. More recently the Federal Court in the context of the registration of a claim under s 190A of the NTA has confirmed that a native title determination application can only be made by a native title claim group (*Risk v National Native Title Tribunal* [2000] FCA 1589 [30]). The Court (O'Loughlin J [29]) cited *Mabo v Queensland No.2* (1991-1992) 175 CLR 1 (Deane and Gaudron JJ at 109-110) that 'ordinarily, common law native title is a communal title, and the rights under it are communal rights enjoyed by a tribe or other group'; and *Western Australia v Ward* [2000] FCA 191; 170 ALR 159 [181] where Beaumont and von Doussa JJ affirmed that the 'NTA plainly contemplates a claim by a group or community of people'. In *Tilmouth v Northern Territory* D6025 of 2001, O'Loughlin J, unreported, the same principles were applied to decide that an acknowledged subgroup of a registered claimant group did not have a right to make a separate claim. The Tribunal considers that the principles affirmed in these cases support its decision that a 'native title party' is the registered native title claimants acting on behalf of the claim group collectively and not each individual registered native title claimant. The Tribunal can see no impediment to proceeding to make a consent determination where the consent is given by the native title party collectively in accordance with its agreed procedures (including traditional law and custom).

[21] It follows from what I have said that I would have been prepared to make a consent determination in this matter without the necessity of receiving evidence of the ancillary agreement and further considering the criteria in s 39. In some cases it may be that parties will wish to provide some evidence in addition to the consent of the parties in order to guard against any possible challenges to the validity of the act. However, the Tribunal is of the view that such evidence would not normally be necessary where it is clear that the consent of the native title party to the doing of the act has been given.

Procedures for making consent determination

[22] In the light of the clearly established practice of the Tribunal which is confirmed by the summary of cases above, the Tribunal in future will adopt the following procedures as guidelines for dealing with applications for a future act determination by consent of all the parties:

1. The Tribunal may, at any time after the application is made, make a determination with the consent of the parties, if the Tribunal considers it appropriate in the circumstances of the case. Any conditions must be within the power of the Tribunal to impose.

2. The Tribunal will normally regard it as appropriate to make a consent determination where the parties (and particularly the native title party) are legally represented and the Tribunal has been advised in writing by those representatives of the consent.

3. The Tribunal will hold a brief hearing to satisfy itself that a consent determination is appropriate. This may occur at the Preliminary Conference.

Determination

[23] The determination of the Tribunal is that the act, namely the taking of all interests including native title rights and interests under the *Land Administration Act* 1997 (WA) in the land the subject of this application, may be done subject to a condition that the grantee party (Monkey Mia Dolphin Resort Pty Ltd ACN 009 342 054) execute and be bound by the agreement entitled 'Malgana Agreement Monkey Mia' between Malgana Claimants and Monkey Mia Dolphin Resort Pty Ltd ACN 009 342 054 prepared by Freehill Hollingdale and Page, Barristers and Solicitors (now Freehills), a copy of which was tendered to the Tribunal in this inquiry.

NATIONAL NATIVE TITLE TRIBUNAL

Hon C J Sumner
Deputy President
22 June 2001

APPENDIX F

Ocean Flooding and Development Levels
Report by MP Rogers and Associates

January 2004

Bowman Bishaw Gorham

Monkey Mia Dolphin Resort Expansion
Ocean Flooding & Development Levels

M P ROGERS & ASSOCIATES

Coastal & Port Engineers

Job J464, Report R130 Rev 0

January 2004

Bowman Bishaw Gorham

Monkey Mia Dolphin Resort Expansion
Ocean Flooding & Development Levels

Job J464, Report R130 Rev 0
Record of Document Revisions

Rev	Purpose of Document	Prepared	Reviewed	Approved	Date
A	Draft for MRA & Client review	M Rogers	D Bobridge	M Rogers	23/12/03
0	Minor revision & issued for Client use	M Rogers	D Bobridge	M Rogers	16/01/04

Form 035 18/01/03

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Table of Contents

1. Introduction

Monkey Mia Dolphin Resort Pty Ltd operates the Monkey Mia Dolphin Resort in Shark Bay. They would like to extend their facilities. The Concept Development Plan was prepared in August 2002 by Taylor Burrell Town Planners. This plan shows the following key features for the proposed development.

- Shops, café, restaurant and function centre,
- 100 hotel suites,
- 30 Bungalows,
- Administration and reception offices,
- Backpackers accommodation,
- Relocation of existing motel units,
- Caravan lots,
- Staff housing,
- Camping area,
- Power station, water treatment plant and workshops, and
- Manager's residence.

The proposed development would occupy various Crown Reserves. Monkey Mia Dolphin Resort Pty Ltd has proposed a 99 year lease of the resort area. The details of the lease are still being negotiated.

The location of Monkey Mia is shown in Figure 1.1, the proposed Concept Development Plan is shown in Figure 1.2 and the general topography is shown in Figure 1.3. As part of the approval process, Bowman Bishaw & Gorham (BBG) is preparing a report into the environmental aspects of the project. This work needs to include an assessment of the appropriate reduced level for the new development to ensure that there is an acceptably low risk of flooding during extreme storms in the ocean.

BBG engaged M P Rogers & Associates Pty Ltd (MRA) to complete an assessment of the appropriate development level for the proposed

expansion. This report outlines the assessment criteria, data and analysis methods, as well as the recommended development level.

2. Criteria for Assessing the Development Levels

2.1 Natural Flooding & Risk to Development

Land and buildings near rivers, estuaries, embayments and ocean coasts can be inundated by floodwaters as a result of:

- local rainfall runoff,
- river flow,
- astronomical tides,
- storm surge,
- tsunamis or tidal waves,
- seiching, and
- local wave set-up and run-up.

Each of these factors has its own statistical distribution that relates the magnitude or severity of the event to a probability of occurrence. The criteria that is suggested for the minimum land and building levels in the development should include due consideration of the natural flooding regime as well as the intended use of the area or building, and the damage and inconvenience that inundation would cause. In addition, possible future changes in the natural regime should be considered, eg the possible Climate Change and increase in the global sea level due to Greenhouse Effects.

In Western Australia, there is little in the way of guidance for determining appropriate levels in relation to possible flooding. The Western Australian Planning Commission (1996) and the Ministry for Planning Policy DC 1.8 (Procedures for Approval of Artificial Waterways and Canal Estates) provide similar recommendations. The latter document recommends "*Finished ground levels and buildings should be above the 100 year flood level as determined for the canal estate making allowance for the predicted effects of climate change.*"

2.2 State Coastal Planning Policy

Earlier this year, the Western Australian Planning Policy released the Statement of Planning Policy No 2.6 – State Coastal Planning Policy. This policy deals with coastal planning and provides assessment criteria for set back distances for coastal development. The policy also states the following.

"Any development located to the north of latitude 30 degrees……..…should be set back from any areas that would potentially be inundated by the ocean during the passage of a Category 5 cyclone tracking to maximise its associated storm surge."

Unfortunately, this statement provides little practical guidance as there are several other issues besides the cyclone intensity and track. The joint probability of the storm surge with the astronomical tide, wind set up, wave set up and wave run up are also important in the total flood level and risk of flooding.

As the State Coastal Planning Policy does not address all of the relevant physical processes, there are significant limitations in applying the policy to the situation at Monkey Mia Dolphin Resort. To address other relevant physical processes, advice has been sought from the Department of Environment.

2.3 Department of Environment

The Department of Environment (DOE) now includes sections of the Water & Rivers Commission that historically provided advice in the setting of appropriate private development levels along the rivers and estuaries of Western Australia. Mr Ric Brettnall is the senior engineer in relation to this type of assessment. He has advised that the usual approach is to account for the following.

- Steady water level with a 100 year Average Recurrence Interval (ARI).
- Allowance / freeboard of 0.5 or 0.75 metres for Climate Change, wave and wind set up and a factor of safety for uncertainty.

Mr Bretnall has also advised that some local authorities are happy to accept a reduced freeboard to better match the existing development levels. In other words, these communities are accepting a slightly elevated risk of flooding.

2.4 MRA Approach for Residential & Commercial Buildings

MRA has considered the available criteria for assessing the appropriate development levels of coastal land to provide an appropriate and low risk of flooding. The MRA rationale and criteria are outlined below.

There could be significant damage if a residential or commercial building were to be inundated. Building finishes, floor coverings, furniture, window treatments, household appliances and commercial stock could be damaged

or lost by flooding. In addition, there is the possibility of danger to occupants during flood events.

Consequently, it is appropriate to adopt a minimum building level that provides a very small risk of the building being inundated in a 100-year period. The 100-year period is often taken as the approximate service life of residential buildings and some commercial buildings and is roughly the proposed term of the lease for the expanded resort land. The following is recommended in assessing the minimum Finished Floor Level (FFL) of residential and commercial buildings and would provide a small frequency of inundation over a 100 year period. This does not mean the building won't ever be flooded, but simply, the risk of flooding is very small (less than once in 100 years on average).

- Still Water Level (SWL) with 100 year Average Recurrence Interval (ARI). This may result from the individual or combined effect of astronomical tides and storm surge.

- Local and short-term effects such as seiching of embayments and basins, local wave set-up and wave run-up. The magnitude of event that could occur in concert with the SWL with a 100-year ARI should be used. If information on joint probability is not available then the 100-year ARI event could be used as a conservative estimate.

- The possible impacts of an increase in the global sea level associated with Climate Change caused by the Greenhouse Effect. It is suggested that due consideration of the uncertainty of the Climate Change actually occurring be taken into account. At this stage it would seem appropriate to consider the projections for 2103 and the mid-range predictions in IPCC (2001). At this stage assume that the mean sea level in 2103 would be about 0.4 metres higher than at 2003 due to Climate Change.

- A Factor of Safety or Freeboard should be included to account for inaccuracies in the data used and provide a freeboard to reduce the frequency of inundation. In fact, the adoption of even 0.3 metre as freeboard can significantly reduce the frequency of inundation. This is because along the south west coast of Western Australia, the difference between the SWL with 100 year ARI and the 500 year ARI can be in the order of 0.3 metre.

This approach is in keeping with the DOE approach for rivers and estuaries and properly accounts for Category 5 Cyclones affecting the study area. It is recommended that the MRA criteria be used as an initial estimate of the appropriate development level for the proposed expansion to the Monkey Mia Dolphin Resort. Should the calculated development level be

significantly higher than the existing development at Monkey Mia and Denham, then further consideration may be warranted. This is in line with the DOE approach outlined by Mr Brettnall.

The Concept Development Plan (Taylor Burrell, 2002) states that all accommodation units and amenity buildings will be constructed on ground raised to 3 metres above AHD. This would give a finished floor level of about 3.1 metres above AHD.

2.5 Shire of Shark Bay Policy Manual

The Shire of Shark Bay Policy Manual (1999) provides guidance for development levels in the town of Denham. This Policy Manual states: *"The minimum floor level for any building or structure in Denham be set at 2.8 metres above AHD."*

3. Assessment of Appropriate Development Level

3.1 Astronomical Tide & Ocean Storm Surge

The following astronomical tidal variations in Shark Bay are provided on navigation charts AUS 747 and 748.

Table 3.1 Astronomical Tidal Levels

Location	Mean High High Water	Mean Low High Water	Mean Sea Level	Mean High Low Water	Mean Low Low Water
Carnarvon	1.5 m	1.3 m	1.0 m	0.8 m	0.6 m
Monkey Mia	1.8 m	1.5 m	1.2 m	1.0 m	0.6 m
Denham	1.2 m	0.9 m	0.8 m	0.7 m	0.4 m

Notes:

1. The tidal datum for all three stations is quoted as Lowest Astronomical Tide.

The Department for Planning & Infrastructure (DPI) and its predecessors have operated a tide gauge measuring the ocean water level at Carnarvon since 1968. This is the longest ocean water level record available for the waters of Shark Bay. There have been a number of severe cyclones influencing the area during the recording period.

There have been tide gauges at Denham and Monkey Mia for much smaller periods. The Denham gauge was in operation from July 1986 to December 1989. The tide gauge at Monkey Mia was only in operation from July 1988 to November 1988. These records of the ocean water levels do not provide sufficient data for a reliable estimation of the extreme ocean water levels and storm surges.

The Department of Marine & Harbours (1988), now DPI, investigated the extreme ocean water levels and storm surges at Denham in response to the flooding caused by Tropical Cyclone Herbie in May 1988.

This report examined the relationship between the ocean storm surges at Carnarvon to that at Denham. Based on the limited records, it was estimated that the storm surge at Denham would be about 1.3 times the storm surge at Carnarvon. Naturally, there can be significant variation in this relationship depending on the track of the cyclone.

The same report estimated that the storm surge at Carnarvon with a 100 year ARI was 1.78 metres. Using this and the above multiplier for the storm

surge at Denham, the 100 year ARI storm surge level at Denham was estimated to be 1.78 metres x 1.3 = 2.3 metres.

A statistical analysis of the total ocean water level (astronomical tide and storm surge) versus return period was also presented in DMH (1988). The 100 year ARI total ocean water level at Denham was estimated to be 2.86 metres above Chart Datum or 2.5 metres above Mean Sea Level. This equates to a tidal level of 0.2 metres MSL plus 2.3 metres storm surge.

Review of the natural setting of Denham and Monkey Mia suggest that they would experience reasonably similar ocean storm surge. Using this assumption, it has been judged that the 100 year ARI total still water level at Monkey Mia would also be 2.5 metres above the Mean Sea Level. It is recommended that this value be used in the assessment of suitable development levels for the proposed extension of the Monkey Mia Dolphin Resort.

3.2 Wind & Wave Set Up

The above still water level is relevant to the position from the shore of the Denham tide gauge. The gauge is located about 100 metres from the shoreline and the adjacent seabed has a reduced level of about 0.3 metres above Chart Datum. During severe cyclone events the strong onshore winds and the action of waves breaking on the shore can elevate the still water level even higher that that at the tide gauge site.

The amount of wind and wave set up was estimated using the SBEACH program produced by the US Army Corp of Engineers. The 100 year ARI wind speed was taken from the Australian Standard (AS 1170 Part 2 Wind Loads). Figure 3.1 shows the resultant estimate of the wind and wave set up in the nearshore area. The action of the wind and waves breaking on the shore could increase the still water level by about 0.5 metres for the extreme design event. It is recommended that this value be used in the assessment of the development level for the proposed extension of the Monkey Mia Dolphin Resort.

3.3 Climate Change

The International Panel on Climate Change (2001) has presented various scenarios for the possible change in climate and rise in the general sea level over the coming century. There is still some uncertainty as to which scenario will actually occur. In addition, the numerical modelling of atmospheric and oceanographic processes is far from perfect. These factors combine to give a wide range of predictions for the future climate and global sea level. These are shown in Figure 3.2.

Using the mid range of the scenarios, a rise in the sealevel of about 0.4 metre by 2103 is suggested as appropriate for determining the impacts of Climate Change.

3.4 Summary of Assessment Using MRA Criteria

• Still water level with 100 year ARI (100 metres from the shore)	2.5 metres MSL
• Wind and wave set up over last 100 metres to shore	0.5 metres
• Climate change to 2103	0.4 metres
• Factor of safety	0.3 metres
• Recommended minimum Finished Floor Level	3.7 metres MSL

To achieve such a Finished Floor Level, it would be possible to set the fill level to about 0.15 metres lower (about 3.55 metres MSL) and have a 0.15 metre step at the building.

This level is significantly higher than much of the existing development at Monkey Mia and Denham. Imposing the above standard would provide quite different risks of flooding for the old and the new developments. In addition, there could be significant practical difficulties with quite different development fill levels.

The above level is also much higher than that set by the Shire of Shark Bay for the town of Denham. The ocean flooding regime at Denham and Monkey Mia are believed to be similar and hence it can be argued that the Shire's development level for Denham could be applied to Monkey Mia.

Monkey Mia Dolphin Resort Pty Ltd plans to have the Finished Floor Level at about 3.1 mAHD. This level is above the estimated ocean flood level with 100 year ARI. It is also 0.3 metres above the Shire's requirements for Denham, but 0.6 metres lower than the level calculated using the MRA criteria. In view of the existing development levels at Denham and Monkey Mia, and the Shire's policy on new development at Denham, the proposed development level of 3.1 mAHD would provide an appropriate level of security against flooding of the proposed development.

4. References

Coastal Engineering Research Centre, 1989. *SBEACH: Numerical Model for Simulating Storm-Induced Beach Change.* Developed by US Army Corps of Engineers.

Department of Marine & Harbours, 1988. *Prediction of Extreme Water Levels due to Storm Surge at Denham.* Report DMH 12/88 prepared by the Engineering Division of DMH.

Ministry for Planning (1999). *Policy DC 1.8 (Procedures for Approval of Artificial Waterways and Canal Estates).* Published by the Western Australian Planning Commission, Perth WA, February 1999.

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Taylor Burrell (2002). *Monkey Mia Concept Development Plan.* Prepared for Monkey Mia Dolphin Resort Pty Ltd, August 2002.

Western Australian Planning Commission, 2003. *State Coastal Planning Policy – Statement of Planning Policy 2.6.* Published by the Government of WA in April 2003.

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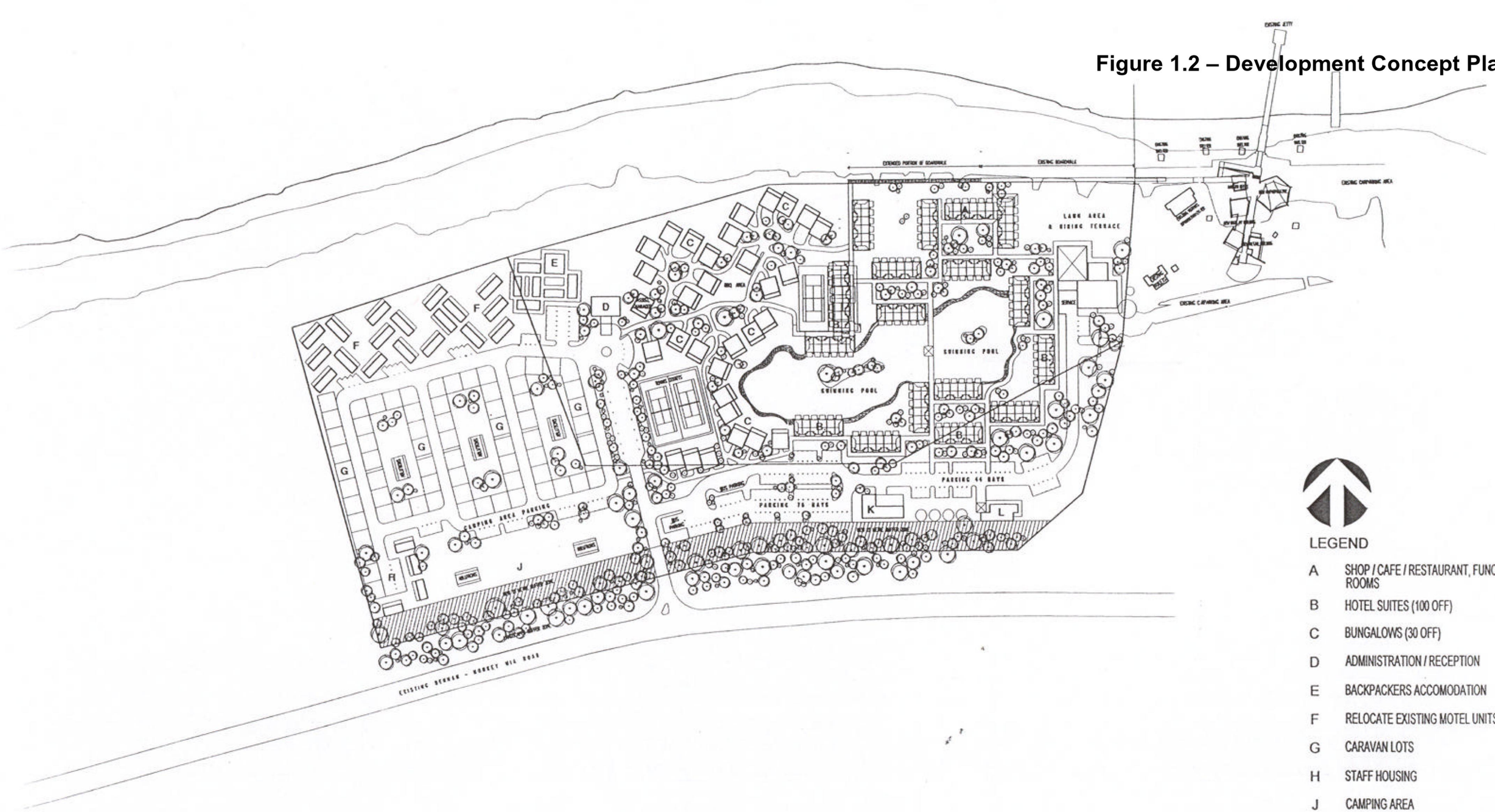
5. Figures

Figure 1.1 – Location Diagram

Figure 1.2 – Development Concept Plan



LEGEND

A	SHOP / CAFE / RESTAURANT, FUNCTION ROOMS
B	HOTEL SUITES (100 OFF)
C	BUNGALOWS (30 OFF)
D	ADMINISTRATION / RECEPTION
E	BACKPACKERS ACCOMODATION
F	RELOCATE EXISTING MOTEL UNITS
G	CARAVAN LOTS
H	STAFF HOUSING
J	CAMPING AREA
K	POWER STATION / WATER TREATMENT WORKSHOP & YARD
L	MANAGERS RESIDENCE

MONKEY MIA DOLPHIN RESORT

CONCEPT DEVELOPMENT PLAN 1:1000

OVERMAN ZUIDEVELD

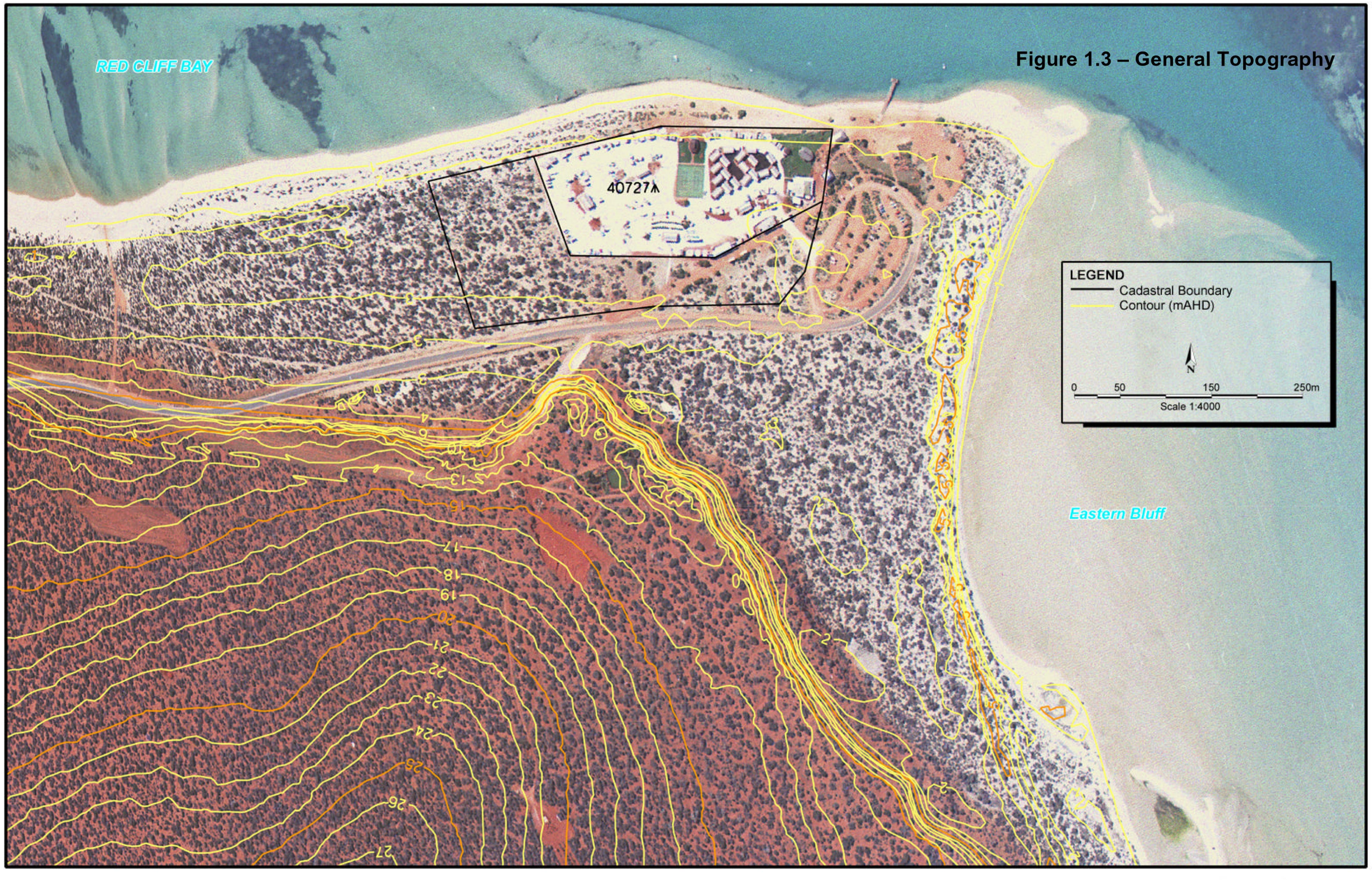
0 50 100

ARCHITECTURE
PLANNING
INTERIOR DESIGN

SCALE 1:1000
DATE 11/02/02
DRAWING NO 920SDP-TB
CAD FILE 920STEDEV1.DWG

64 FITZGERALD STREET NORTHBRIDGE PO BOX 115 NORTHBRIDGE WESTERN AUSTRALIA 6865
TEL (08) 9227 6900 FAX (08) 9227 6455
EMAIL owmh@overmanzuideveld.com.au

Figure 1.3 – General Topography



Topography

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

Figure 3.1 – Wind & Wave Set Up at Shoreline

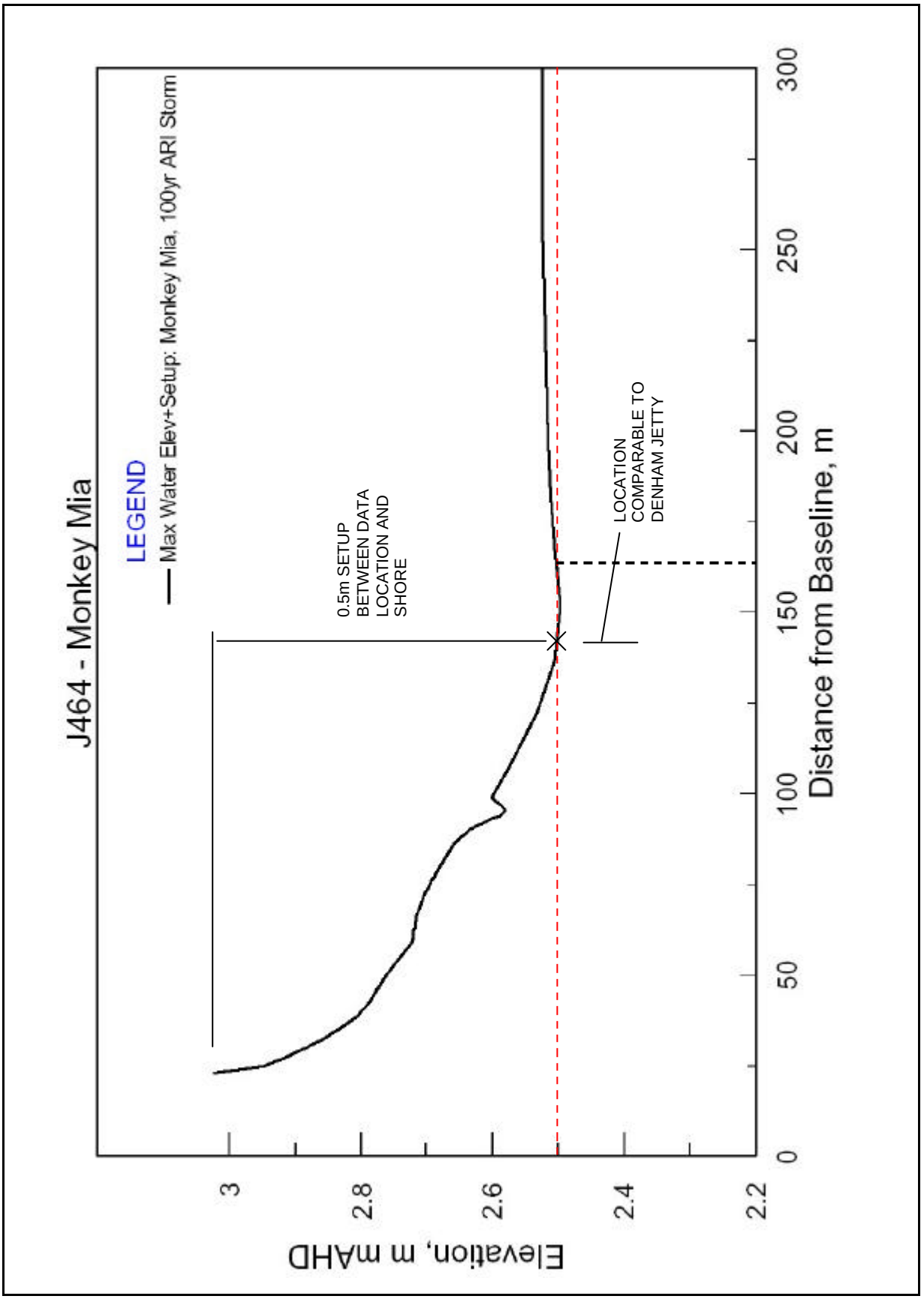


Figure 3.2 – Sea Level Rise Scenarios