Esperance Eastern Coast Planning and Management Report

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ESPERANCE EASTERN COAST
PLANNING AND MANAGEMENT REPORT

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FOREWORD

This report presents plans and recommendations for coastal management of vested and unvested Crown reserves and vacant Crown land east of Esperance. The aim of the report is to determine priority areas for development of recreation and tourist activities between Cape le Grand and Cape Arid National Parks. Additional recommendations are made to the 'Duke of Orleans Bay Regional Park Plan of Development and Management' (1983, Bulletin 138, Department of Conservation & Environment) as well as development recommendations for Alexander Bay and Kennedy's (Blackboy Creek).

The report was instigated by a request from the Minister for Lands for an environmental assessment of the impact of a chalet development at Alexander Bay. In 1982, the Shire of Esperance asked the Department of Lands and Surveys to release land to them at Alexander Bay for the purpose of a "Chalet Village". Subsequent investigations have resulted in the choosing of a site and the preparation of an 'Alexander Bay, Proposed Chalet Village, Planning Report' (May 1983, Department of Lands and Surveys).

Since the individual developments should not be viewed in isolation, the impact of the proposed development has been determined on nearby coastal areas with respect to available resources and use constraints. It would be preferable that a regional perspective, in this case the entire coastline within the Esperance Shire boundaries, be taken, however it was considered out of the scope of this Study.

REPORT SUMMARY

The conclusions and recommendations of this report are:

1. Duke of Orleans Bay Regional Park

   - Incorporate the Wharton Townsite, Crown Reserves and vacant Crown land to the east of Mungliginup Creek to form the Duke of Orleans Bay Regional Park to be vested in the Esperance Shire (Bulletin 138, Department of Conservation and Environment).
   - Change the purpose of the reserve at Duke of Orleans Bay from "Townsite" to "Recreation".
   - Extend the Orleans Bay Caravan Park reserve to include an area for tent camping and further chalet development (Sections 5.1.2 and 5.1.3).
   - Develop an authorised low-key camping area at Mungliginup Creek and a picnic and parking area at Membinup Point. Upgrade the access to be suitable for conventional vehicles (Section 5.1.4).

2. Alexander Bay

   - Vest a reserve for Camping and Recreation in the Esperance Shire at Alexander Bay. The reserve should extend west from Alexander River to the western headland of Alexander Bay and extend for approximately 2km inland (Figure 2 and Section 5.2.3).
   - A Chalet Village is unsuitable at Alexander Bay (Section 5.2.4). A more favourable site for chalet development, which could better cater for long-term community and visitor needs exists at the Duke of Orleans Bay (Section 5.1.3).
   - Develop areas for picnics and low-key camping at Alexander Bay as outlined in Section 5.2.4.
   - Maintain a single 4WD access track to Alexander Bay.

3. Kennedy's (Blackboy Creek)

   - The limited use of Kennedy's indicates that this area should be retained as vacant Crown land at present. As the area has a long-term recreational potential, however, the area should become the responsibility of the Shire as funds become available for the provision of recreational amenties and improved road access.

4. Vacant Crown Land

   - It is premature for further recreational land to be vested in the Shire of Esperance. When they can show they have the finances to provide amenities and improved road access and the capability to manage these areas then vesting may be reconsidered.

- Areas landwards of the recreation areas would be best reserved for the Conservation of Flora and Fauna, with the proviso that access routes to the beaches are maintained.
- Management plans which take into account the special management requirements of flora, fauna and aboriginal sites need to be developed in any areas which are recommended for reserves in the future.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

1. INTRODUCTION

The Esperance region with its visitor appeal, is an area with immense tourist potential. The coastline has many popular fishing and tourist spots which attract large numbers of visitors each year. To fulfil the needs of the population it is important that adequate accommodation and recreation facilities are made available. At the same time, it is imperative that responsible management and protection occurs to prevent degradation of the fragile coastal environment.

1.1 THE STUDY AREA

Esperance lies south east of Perth at approximate latitude 34° south and longitude 121° east (Figure 1). The study area focuses on the Duke of Orleans Bay and Alexander Bay which lie 100-150km east of Esperance. This coastal area includes both vested and unvested Crown reserves and vacant Crown land and is bounded to the west by Cape le Grand National Park and to the east by Cape Arid National Park (Figure 2).

The Wharton Townsite has been recommended to be included in the 'Duke of Orleans Bay Regional Park' (Bulletin 138, Department of Conservation and Environment) which is to extend to the eastern side of Mungliginup Creek and be vested in the Esperance Shire. The land east of Mungliginup Creek to the western boundary of Cape Arid National Park is presently vacant Crown land.

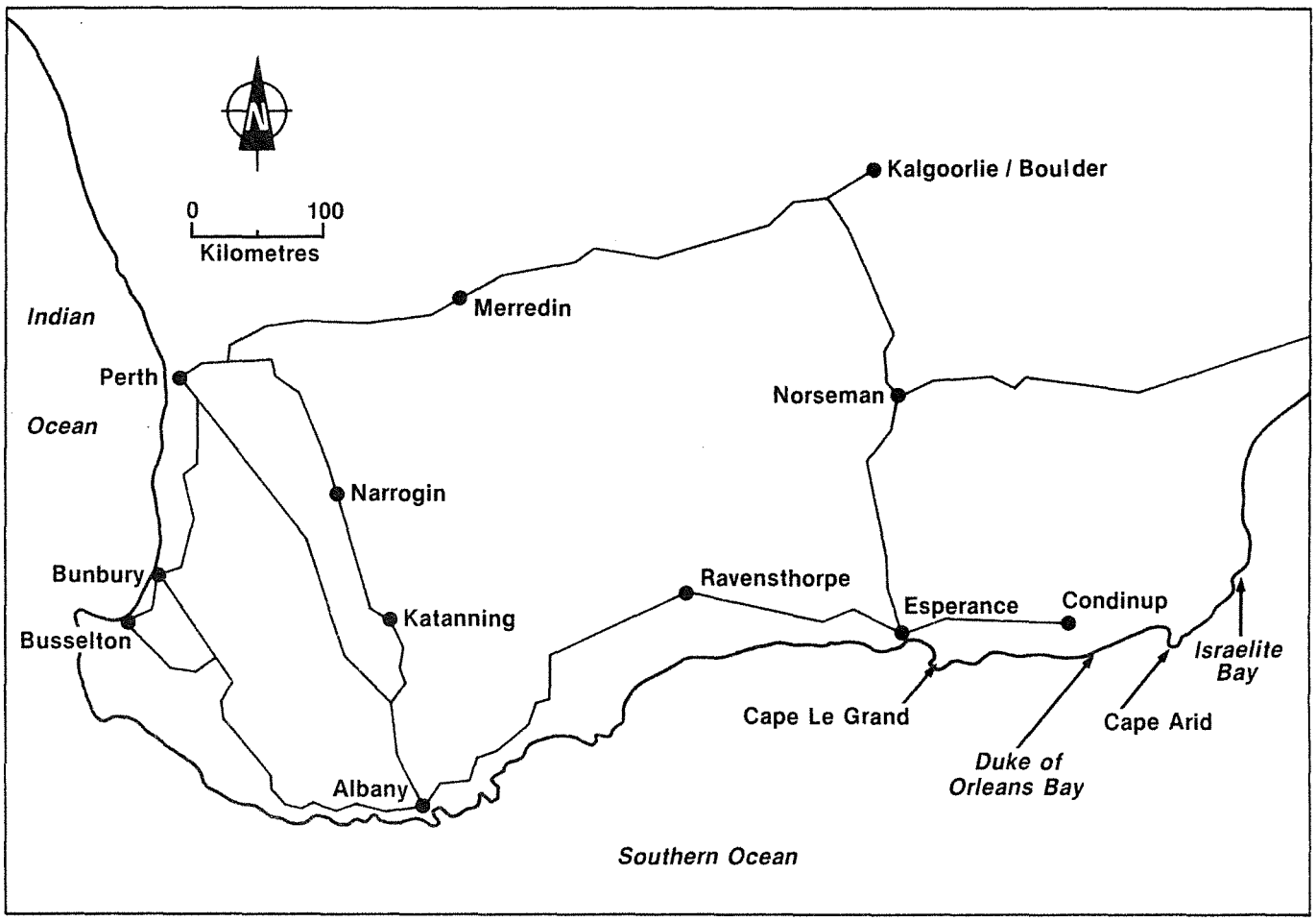

Figure 1 — South-west Western Australia showing the location of Esperance.

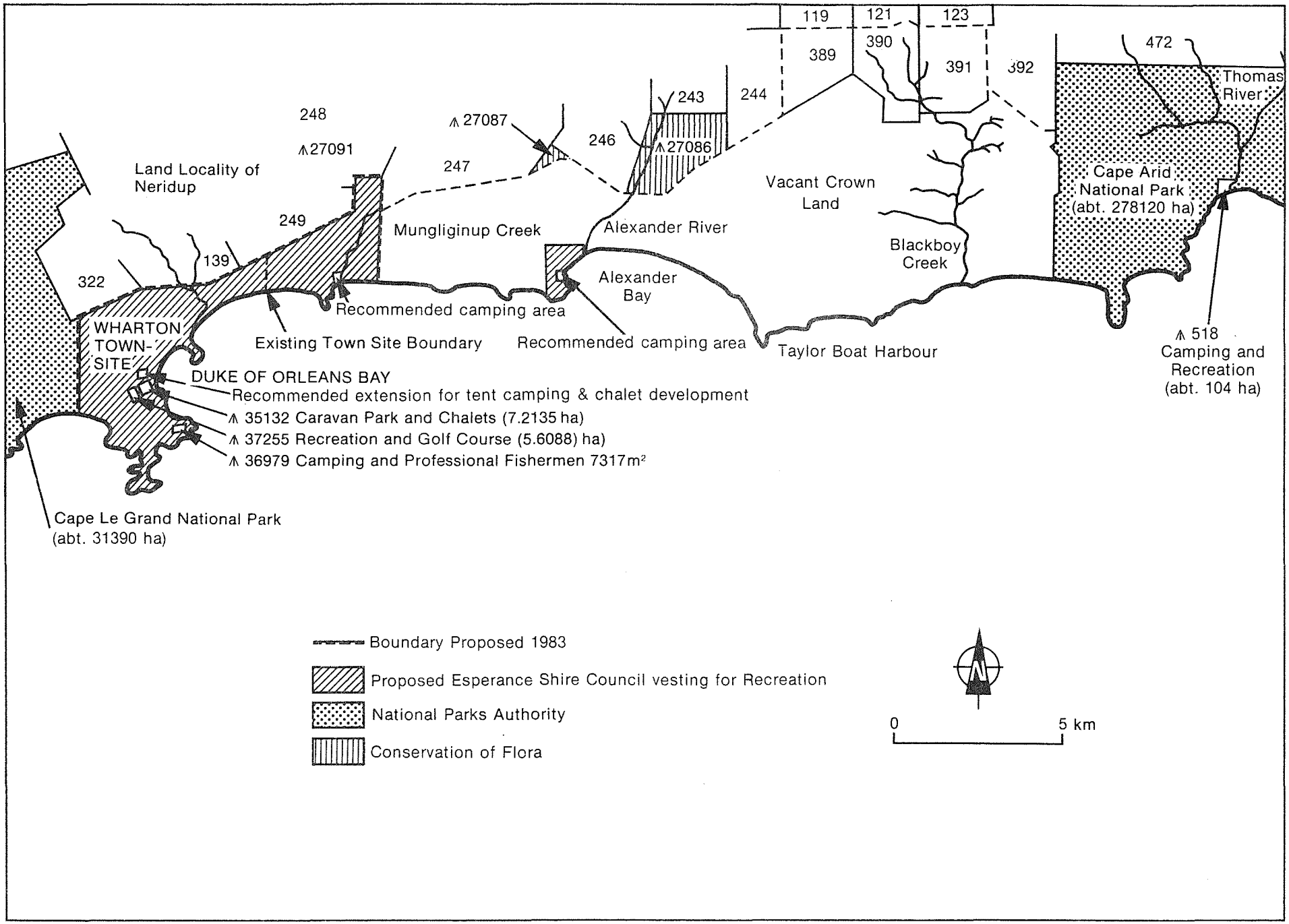

Figure 2 — Recommended areas for vesting in Esperance Shire and adjacent land tenure.

2. NATURAL RESOURCES

2.1 CLIMATE

The Esperance coastal region enjoys a warm Mediterranean climate with an annual dry season of 5 to 6 months occurring between November and April. At Esperance the annual average rainfall recorded over 92 years is 675mm, with 57% falling between May and August (Table 1). In the six sinter months at least some rain has always been recorded, whereas the summer months can frequently be rainless.

Table 1 - Rainfall figures recorded at Esperance for the period 1883-1975 (source: Bureau of Meteorology, Perth)

	J	F	M	A	M	J	J	A	S	O	N	D
Average	18	20	28	45	82	100	108	97	71	55	28	23
Highest	134	119	125	175	179	273	240	185	175	146	115	81
Lowest	0	0	0	2	20	28	24	19	11	13	0	0

TOTAL AVERAGE ANNUAL RAINFALL = 675mm

The average maximum temperature for both January and February is 25°C and the average July minimum is 18°C. Cool breezes and cloudy weather predominate for most of the year.

A general impression of dominant wind direction and intensity for the Esperance coastal district is best obtained from the four years of records for Esperance, provided by the Bureau of Meteorology, Perth.

Summer AM winds are light north easterlies which tend south, south east towards the end of the season. The prevailing PM winds are south and south easterlies often up to 20 kilometres per hour. By April AM winds tend westerly but they are usually of low intensity. Westerly and north westerly winds are experienced throughout the day for June/July with some gale force conditions. In August/September AM winds tend westerly while PM winds are mainly south westerly with the main wind speed at 6 to 10 kilometres per hour. October/November sees a gradual return to the summer wind pattern.

2.2 GEOLOGY AND LANDFORMS

The coastal area east of Esperance consists of four distinct geological and landform units which occur in a regular order from the coast to further inland (Figure 3). Precambrian massive granitic rocks occur as rounded headlands dotted along the coast. They are separated by sandy bays and associated fringing sand dune formation of Quaternary age. The sand dune formations generally form against a scarp of Tertiary rocks which rises gently to an inland plateau at over 100m above sea level.

1. The granitic and gneissic headlands are generally only slightly altered and weathering occurs as sheet exfoliation. The massive granite outcrops are only slightly jointed but the gneissic rocks have a more pronounced joint pattern.

2. The sandy bays are asymetrical in shape due to the orientation of the coastline relative to the incoming westerly wave swells. These bays have developed a small protected stretch of beach facing east, and a generally larger, unprotected stretch of beach facing south and west. Recent foredune development has occurred along the length of the sandy bays, usually as a single dune ridge adjacent to the beach. Along east facing sections of the bays, the foredunes may be only poorly developed but are generally well vegetated and stable. The foredunes along west facing beaches are generally unstable and poorly vegetated. Large blowouts have occurred in the past and are continuing to develop at present. Some of these mobile dunes reach over 200m above sea level and may partially or completely cover the scarp.

Older Holocene dunes representing several phases of dune formation occur behind the present foredune system. These are generally well vegetated, but the older dunes along the exposed west facing beaches are susceptible to erosion.

3. The scarp, consisting of rocks of the flat-bedded Pallingup Siltstone Formation, formed by dissection of these rocks during Pleistocene low sea levels. Siltstone is a light coloured, frequently banded siltstone and spongolite. The siltstone is very variable and grades into a medium silty sandstone. The spongolite is also a very variable rock which contains various amounts of sponge spicules, fossil shells, sand grains and silt. The Pallingup siltstone occurs as very rubbly, weathered outcrop which is variably silicified.

A thin silicious sand overlies the unit in part. This is windblown material from the coast which generally occurs as irregular remnants of previously existing eolian mobile dunes. Several phases of eolian dunes have occurred, but these are most evident and best preserved on the plateau. These siliceous sand dunes are compacted and only slightly lithified with depth.

4. The plateau is an extensive flat elevated area which consists of sand plain deposits (the "Esperance Sand Plain") overlying the upper surface of Pallingup siltstone. Grey, leached sand up to several feet thick and pisolites overly a mottled yellow clay. The plateau is covered by numerous small, circular depressions with sandy bottoms which give rise to semi-permanent, fresh water swamps.

The main drainages such as Alexander River, Mungliginup Creek and Blackboy Creek originate inland on the plateau and have a dendritic drainage pattern. These have dissected the plateau to expose the Pallingup siltstone formation inland. Minor drainage lines are recent features which occur on the scarp.

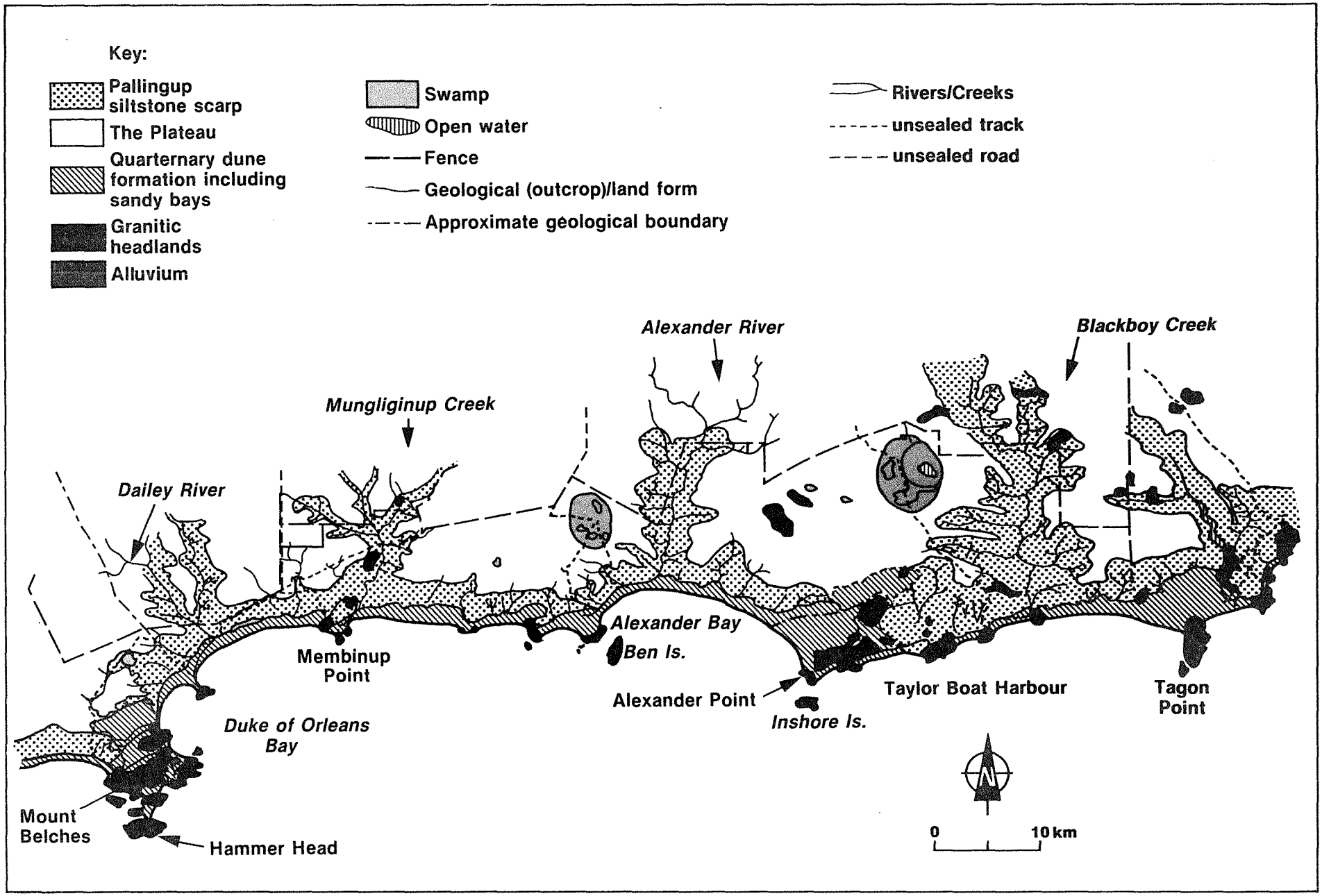

Figure 3 — Regional Geology and Landforms, Mt. Belches to Tagon Point.

2.3 VEGETATION

2.3.1 Plant Communities

A number of plant formations are present in the area of vacant Crown land between Duke of Orleans Bay and Cape Arid. The following description has been modified from Beard (1973).

1. Coastal dune scrub covers the young land surface of predominantly Quaternary sands, which represent several cycles of dune building. On the seaward side of the primary dune there is a low mixed scrub in which *Ricinocarpus glaucus* is abundant. In areas of deep sand, particularly dune ridges, thickets of showy banksia (*Banksia speciosa*) are present. Species of *Melaleuca* often comprise an understorey and form areas of dense scrub in inter-dunal swales. The plant cover is very variable and where the sand is shallow or where the gravel outcrops the vegetation may be less than a metre high.

Coastal foredunes are highly susceptible to erosion when the protective vegetation is removed. Loss of vegetation can be caused by fires, indiscriminate clearing, 4WD tracks and paths or cutting of trees for firewood. Wind erosion of these devegetated areas can cause large blowouts to develop.

2. Scrub-heath is found inland from the coast both on the remnant eolian dunes overlying the Tertiary plateau, where the sands are rather older, and the Pallinup siltstone scarp which may have a thin veneer of eolian sand. A floristically rich community of mainly *Myrtaceae* and *Proteaceae* species grow on the ridges. The hollows are covered with a heath abundant with sedges and *Restionaceae* with scattered christmas trees (*Nuytsia floribunda*).

On the Tertiary plateau, blackboy (*Xanthorrhoea preissii*) is a common component of the shrub layer.

3. Mallee-heath on the Tertiary plateau and scarp is similar to scrub-heath except mallee form eucalypts, especially tallerack (*E. tetragona*) form the tall shrub layer.

4. Mallee. The young soils of the valley slopes of the Dailey, Mungliginup, Alexander, Blackboy and Thomas Rivers support a mallee woodland. Black Marlock (*E. redunca*) is usually dominant in this tall shrub community.

5. Paperbark Woodland. The winter-wet swampy depressions and lakes are colonised by salt-water paperbark (*Melaleuca cuticularis*) near the coast and *M. preissiana* further inland. On the dryer margins growth is more scrubby with water bush (*Banksia occidentalis*) being common.

6. Rock Associations. Granite forms massive domal outcrops but plants can be found growing in patches of soil and rubble clinging to the slopes. The flora is commonly specialised and strongly endemic to this habitat including *Borya nitida*, *Macrozamia reidlei* and species of *Acacia*, *Agonis*, and *Hakea*.

2.3.2 Rare Plants

The study area has not been surveyed by the Department of Fisheries and Wildlife for rare plants. There are occurrences of gazetted rare plants in Cape le Grand National Park, including *Eucalyptus aquilina, E. insularis* and *Lambertia echinata*. In Cape Arid National Park, *Grevillea baxteri* and *Kennedia beckxiana* have been recorded. It is reasonable to expect that some of these species may also be found in the vacant Crown land.

2.3.3 Fire

A long period of evolution in the presence of frequent fires seems to be indicated in the mallee and heath flora of the South Coast. Prior to 1956, when agricultural settlement occurred near Esperance, the effects of fires were limited to those set by aborigines or lightning (Beard, 1973). Burning frequencies have increased, however, by the activities of European man, mainly by fire escapes from campfires, adjoining farms and deliberate lightings. Frequent firing reduces plant cover and effects the composition of the community.

Dune vegetation appears to be particularly subject to degradation by fire from which there is no rapid recovery. This is evident at Blackboy Creek and surrounds which was burnt by a hot fire in September 1981. After three years *R. glaucus* has regenerated on the dunes however recently only infrequent *B. speciosa* seedlings can be observed. This suggests that it will be many years before a mature community will develop.

A fire protection program needs to be developed with co-operation between Esperance Shire, Condingup Bush Fire Brigade, the Bush Fires Board, National Parks Authority and neighbouring land holders.

2.4 WILDLIFE

The faunal records for Cape le Grand National Park (including the biological survey of Kitchener, Chapman and Dell, 1975) and Cape Arid National Park to the east were examined to predict the possible vertebrate assemblage in the vacant Crown land between the two Parks.

1. Mammals. Several species of mammals are commonly found in both National Parks. The Bush Rat (*Rattus fuscipes*) inhabits thickets of *Banksia speciosa*. Flowering Banksias provide a food source for the Honey Possum (*Tarsipes rostratus*) which also frequents low heath environments. The Common Dunnart (*Sminthopsis murina*) has a very wide range, preferring wet and dry open woodland and swamps. The Western Grey Kangaroo (*Macropus fuliginosus*) and the Southern Brown Bandicoot (*Isoodon obesulus*) are also common throughout the area.

The Western Pigmy possum (*Certartetus concinnus*) is seldom seen in the Parks but is possibly not uncommon. A species which has been found infrequently is the Ash-grey Mouse (*Pseudomys albocinereus*). The Tammar Wallaby (*Macropus eugenii*) is probably extinct in the Cape le Grand area but has been recorded from Cape Arid as recently as 1977.

The bone remains of mammals from surface cave deposits have been studied near Marbellup Hill and Mount Arid to determine the past fauna of the area. The now rare Dibbler (*Antechinus apicalis*) has been discovered in these deposits (Appendix 1.1).

Several marine mammals have been sighted in the near shore environment including the Australian Sea-lion (*Neophoca cinerea*), Common Dolphin (*Delphinus Delphis*), southern right whale and the seal.

Exotic mammals are found in the area, including the Fox (*Vulpes vulpes*), Cat (*Felis catus*), House Mouse (*Mus musculus*) and European Rabbit (*Oryctolagus cuniculus*).

2. Birds. A large number of birds have been recorded at Cape le Grand National Park. The 95 species recorded from and sighted at the Park are listed in Appendix 1.2. In addition Mr A Daw has observed and recorded birds in the Esperance area since 1977. Appendix 1.3 lists the 198 species found within the 100 miles to the east and west of Esperance. Species observed at Alexander Bay beach, include the silver gull, pacific gull, pied oystercatcher, sooty oystercatcher and the common sandpiper. The yellow-throated miner (*Manorina flavigula*) was the commonest species observed away from the beach. The New Holland honeyeater (*Phylidonyris novaehollandiae*), the little wattle-bird (*Anthochaera chrysoptera*) and the red-eared firetail (*Emblema oculata*) were observed in *Banksia speciosa* thickets.

3. Reptiles and Amphibians. A large number of reptiles and frogs (36) were collected from Cape le Grand National Park in 1972 (see Appendix 1.4), although it is not known which of these occur further to the east.

Frogs, geckos and lizards, including a bungarra (*Varanus gouldii*) were observed in the study area during April, 1984.

4. Other. An invertebrate survey was undertaken at Cape le Grand National Park in 1977 and the species recorded are listed in Appendix 1.5.

The large number of species and individuals which have been recorded in the National Parks adjoining the study area indicate a very healthy environment. It is important that the National Parks do not become isolated islands of native vegetation as this will reduce their ability to support wildlife populations. Detailed fauna and flora surveys are required in any future management proposal for vesting of the vacant Crown land.

3. HUMAN ACTIVITIES

3.1 ABORIGINAL SITES (by Moya Smith, Western Australian Museum)

Aboriginal people have lived in Australia for over 40,000 years (Pearce and Barbetti, 1981) and during that time have coped with climatic changes, a 150m sea level rise (the present level was reached c.6,000 years ago) and related reduction in the size of the coastal plain, and changes in plant and animal communities. The changing patterns of Aboriginal land

and resource use, widespread trade networks and by implication social networks, are reflected both in ethnographic accounts and in the distribution and content of archaeological sites.

Sites are often separated into two broad and overlapping categories: ethnographic sites and archaeological sites.

Examples of ethnographic sites include: places for current ritual or ceremony, caches of ceremonial objects, sites with mythological associations, or sources of stone, ochre, plants or animals which are known or used.

Archaeological sites are frequently also ethnographic sites; they are the physical remains of Aboriginal culture both before and after European colonisation and include: shelters (wooden structures or stone bases of wooden structures); stone arrangements - lines, circles, walls or mounds used as ceremonial alignments, markers to signify special areas, hunting shelters, or fish traps or weirs; stone or ochre quarries; stone artefact production areas; shell middens; seed grinding patches; engravings; paintings; marked trees; burials or caches of ceremonial or personal objects (Department of Aboriginal Sites, 1983).

Any undeveloped land is likely to contain archaeological sites, and development without prior survey and analysis can result in irreparable damage to fragile archaeological sites, and the loss of not only potentially valuable elements of the Australian Heritage, but also of subsequently irretrievable information about regional socio-economic systems.

Archaeological sites are most frequently discovered by field-walking and inspection of the ground. When it is impossible or impracticable to examine 100% of the land surface, theories about Aboriginal economic systems are related to the geology, topography and vegetation of the area to construct models of regional behaviour, and areas suitable for specific uses (e.g. quarries for deriving stone, reefs for collecting shellfish) are noted and then examined in the field.

1. The Aboriginal Site Survey

In April 1984 a cursory examination of the Crown land between Cape le Grand and Cape Arid National Parks was undertaken, with examination on foot concentrating on exposures of rock suitable for artefact manufacture, freshwater springs or swamps, granite domes (which have a great variety of associated edible plant species), headlands and deflations in the coastal dunes.

Thirty six aboriginal sites were located in the region, and these are listed in the Western Australian Museum's Register of Aboriginal Sites (Appendix 2.1). Ground visibility is virtually nil in much of this region and the number of sites recorded probably represents a very small percentage of the total number present. Obligations of developers or people wishing to disturb sites are covered under Sections 15, 16, 17 and 18 of the Aboriginal Heritage Act 1972-1980 (Appendices 2.2 and 2.3).

The small rockshelter at Mount Belches West (W 1055) is one of three known rockshelters between Esperance and Israelite Bay which has an excavatable deposit containing evidence of Aboriginal use. A test pit (2 x 1m on the surface), excavated in April 1984 yielded stone artefacts, some with traces of *Xanthorroea* resin on them, animal bone, fish scales and much botanical material. Rich organic deposits like this are dateable by Carbon 14 techniques, provide insight into past regional lifestyles and are of value to scientists concerned with climatic change, vegetation patterns etc. So far only one other site in the Esperance region has yielded information of this nature, and provided evidence for 13,000 years of Aboriginal use and occupation of the area (Smith,1982).

2. The Ethnographic Survey

The ethnographic survey of the area between Cape le Grand and Cape Arid National Parks is as yet incomplete, however Aboriginal people have stated that many places in this region were and are frequently visited. The exact nature of Aboriginal traditional ties with this region is not fully known.

Aboriginal people have expressed interest in the coastal region between Cape le Grand and Cape Arid National Parks and 36 archaeological sites have been recorded there. This represents the results of an exploratory survey only and is a representative sample of the area rather than a total list of sites.

Anybody wishing to disturb the region or specific sites should be aware of obligations under the Aboriginal Heritage Act 1972-1980 (Appendix 2.3).

Plate 1 - Use of trail bikes and beach buggies is a popular activity on beach and dune areas.

3.2 PRESENT ACTIVITIES

The coastal region east of Esperance (Figure 4) attracts a large number of visitors annually. The two most popular areas which cater for caravans and campers are the Orleans Bay Caravan Park and Lucky Bay in Cape le Grand National Park. As well there are a number of low-key camping areas along the coast (Table 2).

A recreation survey was carried out by the Department of Conservation and Environment over the Easter Break, 1984 (Appendix 3). Results indicate that the majority of holiday makers visit the study area on a regular basis and are from Esperance (38%) and the Goldfields area (39%). These visitors are attracted by the good fishing and relaxing atmosphere. Tourists from Perth (8%) and other parts of the State are impressed by the beautiful scenery and beaches and the feeling of isolation.

There is a prevalence for people to travel together in social or family groups of 4 to 6 persons. Over Easter 1984, 61% of these groups had access to 4WD vehicles. This reflects the visitors recognition of the need for 4WD access to many parts of this coast.

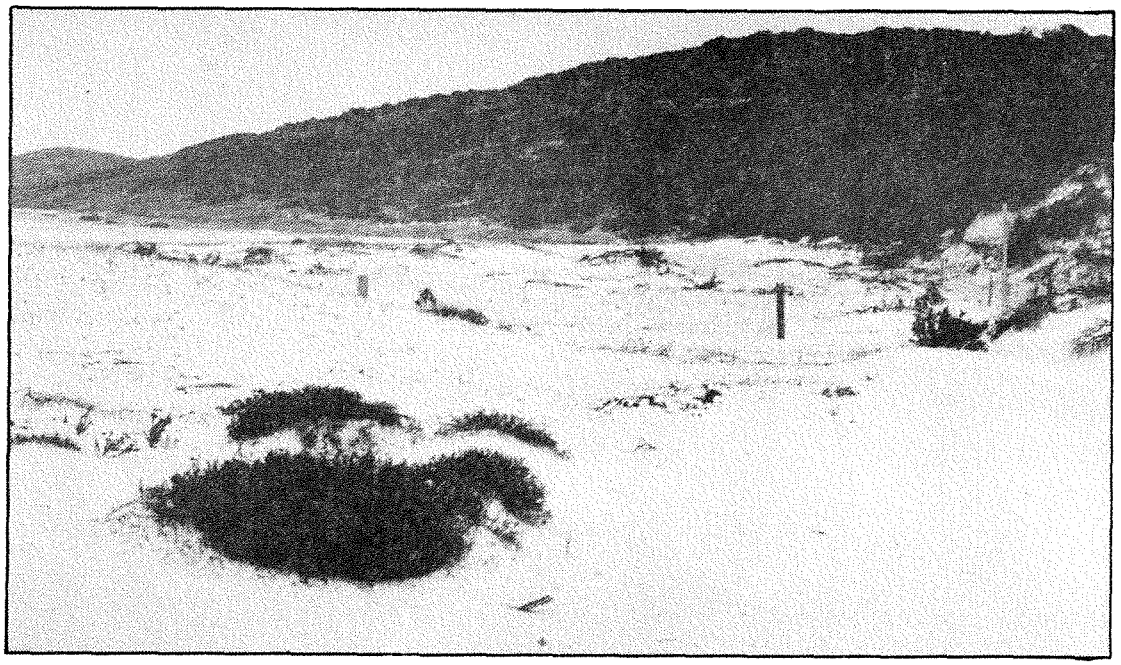

Plate 2 - Stabilisation and revegetation of sand dunes can be exacerbated by off-road vehicles.

Recreation activities include fishing, boating, swimming, diving, walking, nature study, pleasure driving and picnicing. Use of off-road vehicles is also popular (Plate 1), however in environmentally sensitive areas, such as sand dunes, they can initiate bad erosion which is often difficult and expensive to control (Plate 2).

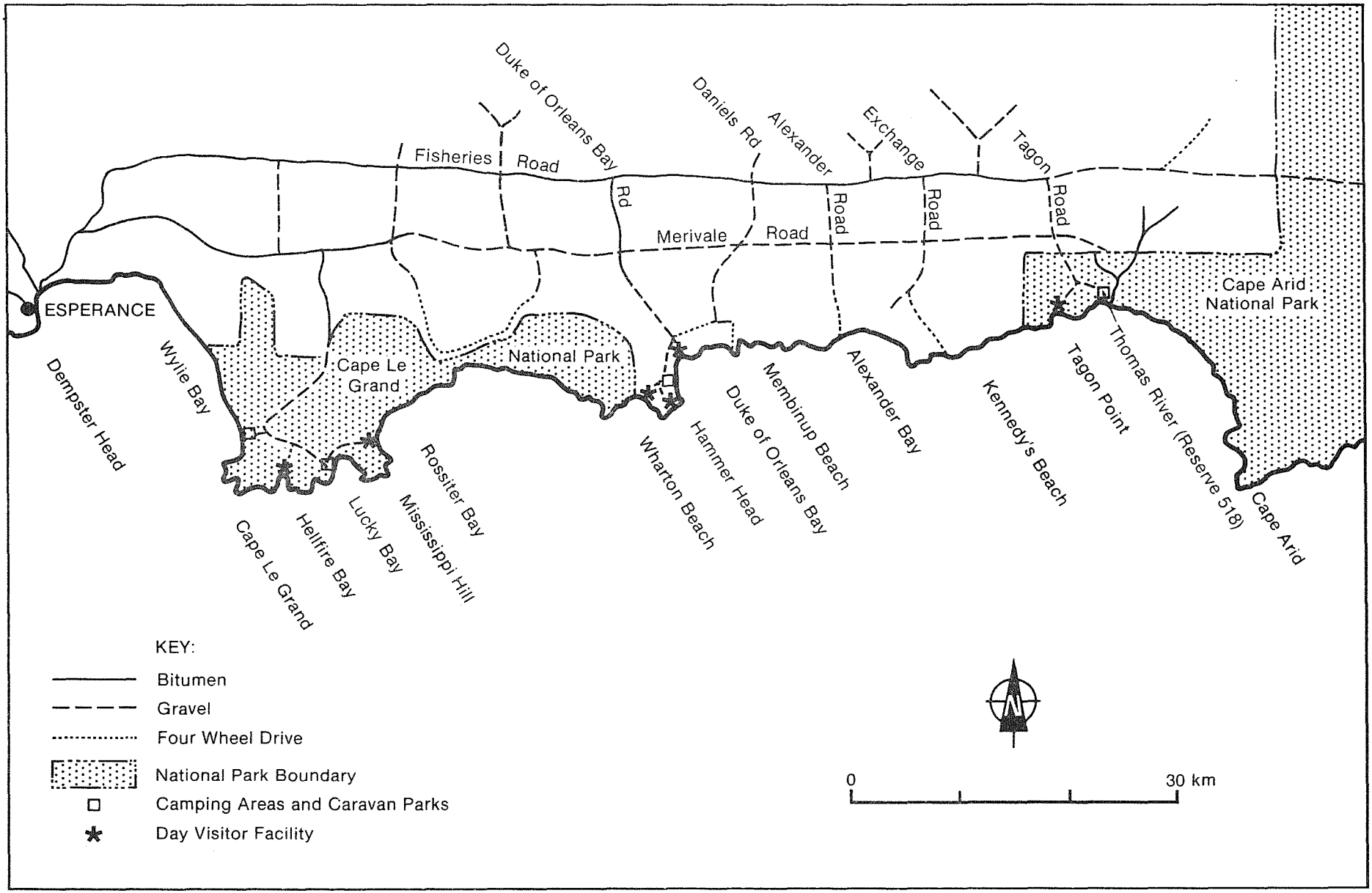

Figure 4 — Recreational Facilities and Access, Esperance to Cape Arid.

TABLE 2 - RECREATIONAL FACILITIES BETWEEN CAPE LE GRAND AND CAPE ARID

( ) proposed 1984

Area	Location	Access	No. Campsites/ Chalets	Picnic	FACILITIES Parking	Boat Ramp	Toilets	Shower	Drinking Water
Cape Le Grand National Park	Le Grand Beach	2WD	10 sites	X	X		X		X
	Hellfire Bay	2WD		X	X		X		
	Thistle Cove	2WD		X	X				
	Lucky Bay	2WD	30 sites	X	X	X	X	X	X
	Rossiter Bay	2WD		X	X		X		
Duke of Orleans Bay	Wharton Beach	2WD			X		X		
	Hammer Head	2WD			X	X			
	Caravan Park	2WD	80 sites 4 chalets				X	X	X
	Orleans Beach	2WD			X	(X)			
	Table Island	2WD		X	X		X		
Membinup Beach		4WD	low-key						
Alexander Bay		4WD	low-key				X		
Kennedy's (Blackboy Ck)		4WD	low-key						
Cape Arid National Park	Poison Creek	4WD	low-key				X		
	Little Tagon Bay	2WD		X	X		X		
	Thomas River	2WD	10 sites				X		
Reserve 518	Thomas River	2WD	low-key				X		

4. MANAGEMENT STRATEGY

4.1 GOAL

The goal of coastal planning and management is to achieve a balance between the protection of environmental quality and provision for the social and economic needs of the community.

4.2 MANAGEMENT OBJECTIVES

In broad terms the management objectives for the Esperance coastal district are listed as follows:-

1. To maintain the fragile coastal ecosystem.

2. To effectively manage environmental problems peculiar to the south coast.

3. To preserve and promote the attractive recreational resource of the south coast.

4. To conserve the scenery, native plants and native animals.

5. To implement a bushfire hazard reduction policy and to suppress bushfires where necessary.

6. To provide and maintain selected recreation areas and facilities, and to confine access to such areas to prevent environmental damage.

4.3 OBJECTIVE IMPLEMENTATION

Management Objectives 1-4:

Only uses that are compatible with the character of the reserves should be permitted, such as walking, sight-seeing, nature study, painting, photography, swimming, camping, fishing and boating. Horse-riding should be confined to selected tracks and beaches.

All types of motor vehicles should be confined to selected tracks. 4WD vheicles, beach buggies and trail bikes will not be excluded from the beach, however, they should be excluded from the sensitive dune systems where their use could initiate dunal blowouts.

All activities should be excluded that conflict with environmental conservation, or that inconvenience or are potentially harmful to other recreationists.

Management Objective 5:

Fire control should be in accord with the Department of Fisheries and Wildlife Policy on Fire in Nature Reserves, as adopted in 1975.

Firebreaks should be planned following consultation with the Esperance Shire Council, Condingup Bush Fire Brigade, Bush Fires Board, National Parks Authority and adjoining land holders.

A prescribed burning programme should be developed as necessary with the dual aims of reducing the fire hazard and regenerating the vegetation. Special attention should be given to recreation areas, camp and picnic fires should be permitted only in developed recreation areas, subject to the provisions of the Bush Fires Act.

The control of wild fires on Shire of Esperance vested Reserves should be the responsibility of local Brigades.

Assistance should be sought from the Bush Fires Board and National Parks Authority as appropriate and available.

Management Objective 6:

In Shire Reserves recreational facilities such as roads, sign posting, picnic areas, camp sites, fire places, boat ramps, toilets, garbage removal, water supplies, etc. should be provided by the Shire, with appropriate assistance from Government.

A Shire Ranger is employed to maintain recreation areas. An additional Ranger should be employed over the summer and Easter Vacation.

5. MANAGEMENT PROPOSALS

East of Esperance overnight facilities for tourists are provided at Orleans Bay Caravan Park and Cape le Grand and Cape Arid National Parks (Table 1). At peak visitor periods (summer holidays and Easter) the demand for camping sites often exceeds the number which are available, so people often move to other illegal or unofficial camping areas. These latter areas, including Membinup Beach, Alexander Bay and Kennedy's (Blackboy Creek) need some formalization and upgrading to low-key camping areas.

Chalet accommodation is also in demand, both on an individual sub-lease basis and as chalets available for rent. The best site for such a development needs to be determined.

5.1 DUKE OF ORLEANS BAY REGIONAL PARK

5.1.1 Extent and Present Status of the Park

A proposal has been lodged with the Department of Lands and Surveys that a Duke of Orleans Bay Regional Park be formed and vested in the Esperance Shire. The Park includes a number of Crown reserves and vacant Crown land and forms an area of 3,460ha (Bulletin 138, Department of Conservation and Environment).

The proposed boundaries are formed by Cape le Grand National Park to the west and vacant Crown land to the east. The Park will include Mungliginup Creek (Figure 2).

The Shire has suggested that the eastern boundary be extended to the western side of Alexander River. This would increase the Park size to approximately 6,000ha.

Details of the resources, use pressures and management planning for the Park are outlined in Bulletin 138, Department of Conservation and Environment.

5.1.2 Orleans Bay Caravan Park

The caravan park (Plate 3) provides a broad range of facilities which attract visitors who desire more sophisticated amenities as well as the recreational activities which are offered.

Accommodation ranges from tent camping and caravan sites, to on-site vans and chalets. The chalets are owner built but can be made available for rent by the caravan park. Amenities provided are toilets, showers, drinking water, kiosk, petrol bowsers, power and telephone. Vehicle access is soon to be upgraded to a sealed road. An airstrip is located nearby.

Recreation facilities include tennis courts, bowling green, golf links, childrens' playground and a boat ramp will be built this year.

At peak visitor periods the caravan park is unable to provide sufficient accommodation compared to the demand (Figure 5). An 'overflow' area to accommodate some 50 tent camping sites would allow better utilization of the caravan park and would require minimal economic input (Area 1, Plate 3).

5.1.3 Chalet Development

There is a paucity of chalet type accommodation in coastal areas both east and west of Esperance townsite. The main groups of people seeking such accommodation are Esperance residents, and visitors from the Goldfields and Perth. The latter group can usually be satisfied by similar accommodation provided in Esperance, but some 'less developed' area is required by the former group.

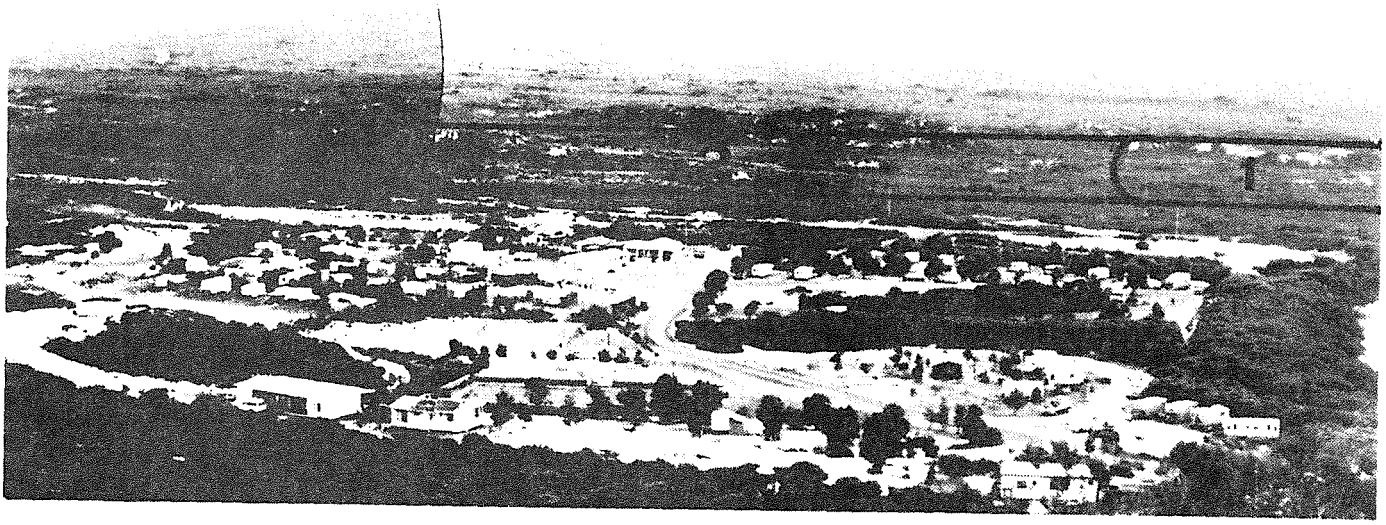

Plate 3 - View of Orleans Bay Caravan Park and Area 1, suitable for tent camping and Area 2, suitable for chalet development

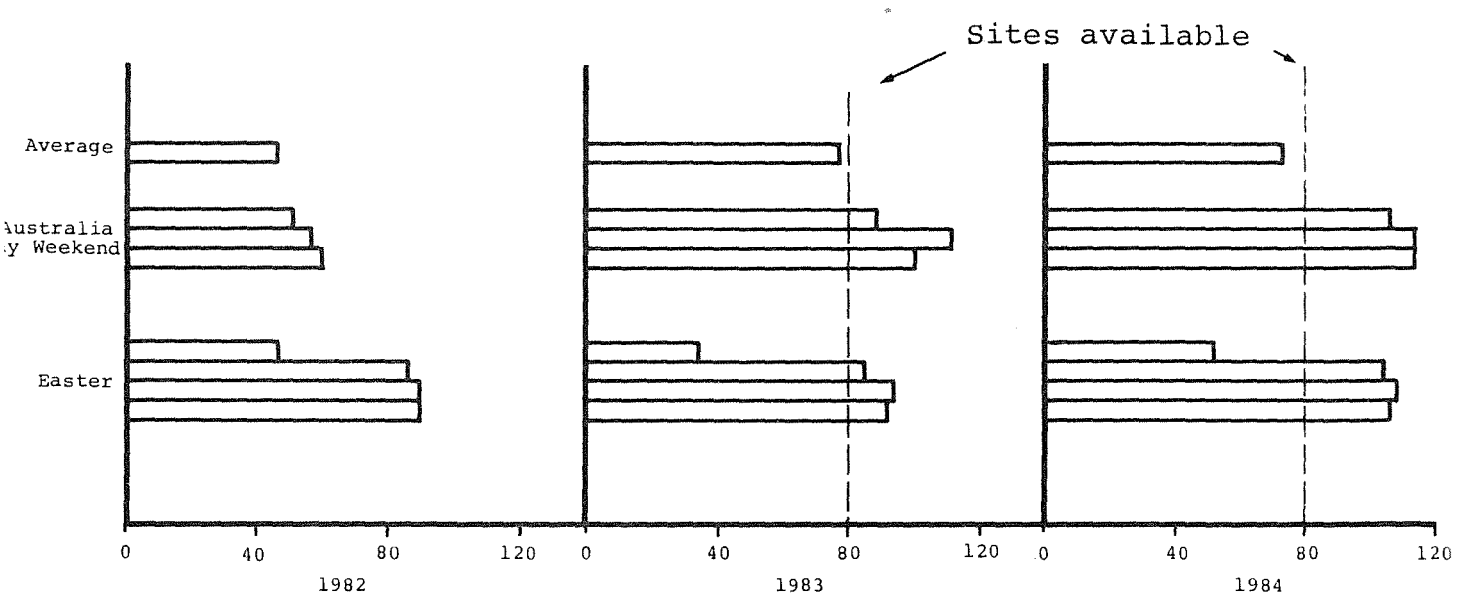

Figure 5: Number of occupied sites at Orleans Bay Caravan Park at peak visitor periods, 1982-1984 (Data courtesy R. Burgess)

The Sand Dune Unit of Chalmers (1983) which comprises a series of sheltered depressions, and low ridges which provide glimpses of the sea, is capable of supporting chalet type development (Area 2, Plate 3). Environmentally, this area would be suitable provided structures are designed and landscaped and drainage and septic effluent are carefully considered to minimise the impact on this relatively open space.

Advantages of a chalet development being located at Duke of Orleans Bay are:-

1. a system of road access for conventional vehicles is provided.

2. materials readily available which are suitable for road construction purposes.

3. public utilities (power and telephone) are readily accessible.

4. a potable water supply.

5. large areas suitable for expansion as required.

6. facilities, such as kiosk, petrol bowsers, airstrip, golf links are nearby.

7. consolidation of tourist and recreational facilities.

Use constraints which influence planning and management are:-

1. highly erodible sandy soils which depend on vegetation cover for their stability.

2. absence of large trees and the associated risk of degradation of the landscape by careless development.

3. drainage may be a problem in some areas.

4. the distance from Esperance which increases the cost of development and management.

5.1.4 Membinup Beach

Mungliginup Creek reaches the coast at Membinup Beach, but only occasionally breaks through the wide sand bar and flows to the sea. Membinup Beach is a popular area for day-trips, particularly as it is only 11km east of Duke of Orleans Bay.

In the sheltered area of salt-water paperbarks (*Melaleuca cuticularis*), near Membinup Point, low-key camping takes place. According to the Shire of Esperance Model Health Bylaw, camping within this area is presently illegal as it lies within a 15km radius of a caravan park.

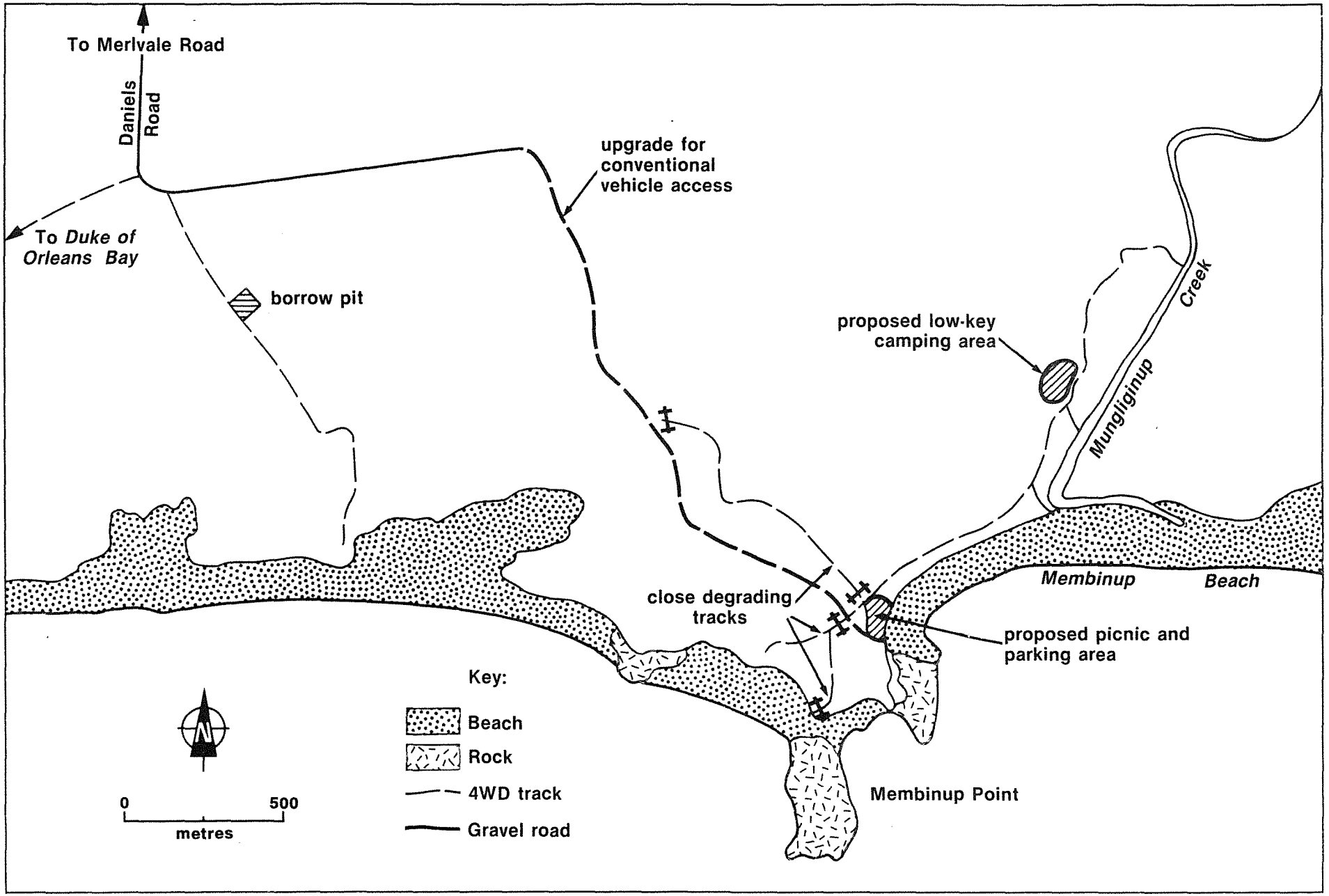

Figure 6 — Concept Diagram of Management Recommendations at Membinup Beach.

The 'Duke of Orleans Bay Regional Park Plan of Development and Management' (Bulletin 138, Department of Conservation and Environment) recommends that Esperance Shire develop authorised low-key camping facilities at Membinup Point. The facilities will include formed gravel access tracks and sites, toilet blocks and a bore water supply. A road to the Point will be designed and constructed.

Further inspection of the area suggests that a more desirable camping area lies near Mungliginup Creek which is presently dominated by showy banksia (*Banksia speciosa*). This would separate camping from day-user activities which focus around Membinup Point. The paperbark swamp area could be upgraded to provide a more attractive picnic and parking area. The badly degraded tracks which lead to the beach west of Membinup Point need to be closed (Figure 6).

A Ranger should be employed during peak visitor periods. His duties should include collection of camping fees to be in line with the National Parks Authority and to prevent a conflict of interests with the caravan park at Duke of Orleans Bay.

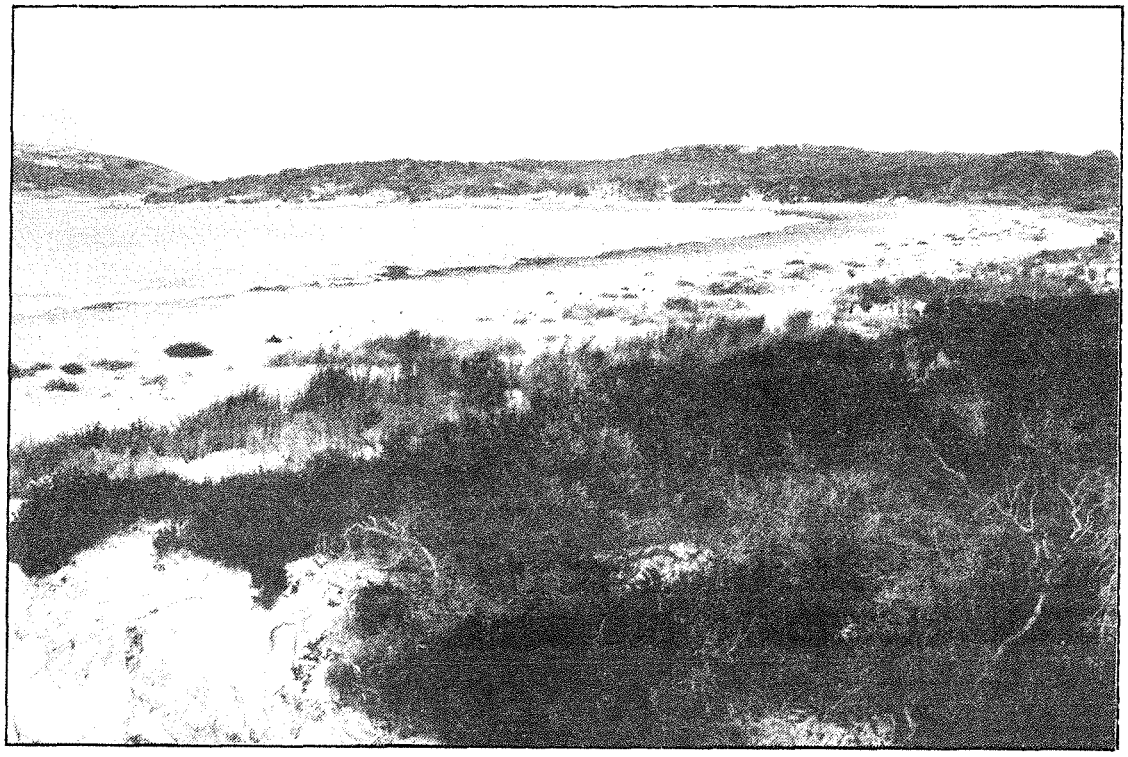

Plate 4 - Alexander Bay is popular for fishing and camping activities.

5.2 ALEXANDER BAY

Alexander Bay is situated approximately 45km east by road from the Orleans Bay Caravan Park (Figure 4). Access to Alexander Bay is negotiable only to 4WD vehicles over a sandy track which becomes difficult to negotiate during late summer and is covered by water in a number of places during winter.

The area is visited by people mainly from Esperance and the Goldfields who are attracted by the 'good fishing' and the 'sense of isolation' which is induced by the lack of development in the area. Another feature is that it is not within a National Park which means that dog owners can visit the area. There was high dog ownership among users during the Recreation Survey over the Easter Break, 1984.

5.2.1 Resources

Aspect. Alexander River flows to the sea intermittently at a point where the bay has a southerly aspect. The popular camping and recreation area lies west of the river where the Bay has an easterly aspect and is sheltered by the headland and Ben Island (Plate 4).

Geology and Soils. The geology and soils at Alexander Bay are closely controlled by the topography of the area.

Areas of relatively high relief consist of unconsolidated eolian sand dunes. The south and south west part of the area is fringed by a series of very steep sand dunes oriented in a NE/SW direction which have developed during the Holocene under prevailing south westerly winds. To the north of these high sand dunes are found lower relief dunes which are oriented roughly east-west and have formed under prevailing easterly winds.

These dunes overly massive, coarse-grained granite in the south west and the Pallingup Siltstone formation in the north and west.

Within the interdunal depressions the soils are fairly shallow. In the vicinity of the proposed chalet village granite occurs within approximately 1.5m of the surface and outcrops in several areas. Pallingup siltstone occurs within 2-2.5m of the surface and also outcrops in one area of the site (Figure 7). The soil depth to bedrock is greater where sand dunes have formed.

Rocks of the Pallingup Siltstone formation outcrop continuously in the vicinity of the main access track to the beach. The rocks occur as very rubbly outcrop and are variably ferruginised and silicified. Thin seams and patches of chert occur.

Vegetation. In broad terms the vegetation at Alexander Bay can be described as coastal dune scrub. Within this plant formation a number of vegetation units can be distinguished although some blending of communities is evident. A detailed vegetation survey was carried out at the southern end of Alexander Bay (Figure 8), however, the following description characterises much of the near coastal area of the Bay.

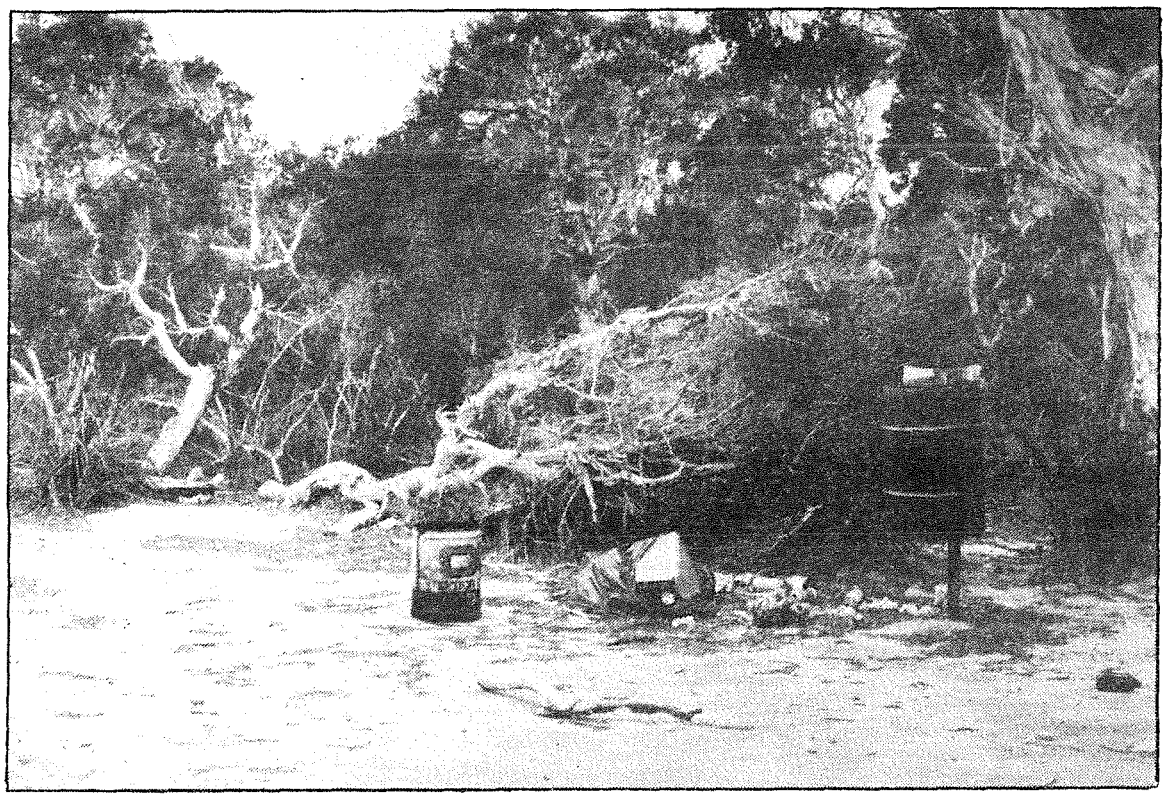

Plate 5 - Chopping of trees for firewood and littering is presently uncontrolled at Alexander Bay.

Beach sand is colonised by hairy spinifex (*Spinifex hirsutus*) and *Euphorbia paralias* (Plate 4). The seaward facing slope of the primary dune is thickly vegetated with wind pruned, salt tolerant species, in particular wedding bush (*Ricinocarpus glaucus*). Dune crests are dominated by showy banksia (*Banksia speciosa*) which usually forms dense thickets in areas of deep sand. The interdunal swales are characterised by an impenetrable scrub of *Melaleuca* interspersed with *Verticordia* and *Agonis*. Further inland where Pallingup siltstones are near the surface, *Eucalyptus* species form a mallee-scrub with scattered associations of pin-cushion (*Hakea laurina*).

A sandy swampy site landward of the primary dune supports a low woodland formation of salt water paperbark (*Melaleuca cuticularis*), adjacent to which a heath of ericoid shrubs has formed. These areas become very swampy during winter.

Fire is a threat to the stability of sand dune areas and is a potential hazard to people camping in the area. The vegetation is also threatened by firewood collection, indiscriminate clearing for campsites and the potential for infestation by disease, especially of Banksia and other proteaceous species by dieback, which is increased by vehicle movement.

Water. Water supply of the area is uncertain. A survey will need to be undertaken to assess the amount of potable water available from bores. This will definitely effect the amount of development which can occur.

Aboriginal Sites (by Moya Smith, Western Australian Museum)

Six archaeological sites have been recorded in the Alexander Bay region (W1184, W1212, W1185, W0807, W0156, W1213).

The majority of artefacts found at campsites are made of locally available stone: chert, quartz and quartzite. Chert is available in nodules embedded in the Pallinup siltstones (Morgan and Peers,1973) which on the coast are visible in blowouts behind the primary dunes. In these areas, the chert nodules have been broken up, the cortex removed and large flakes struck off the central core, the flakes are subsequently reduced further to usable tool forms. Reduction of the stone occurs both at quarries and campsites. Chert quarries are easily disturbed and damaged: cars and trail bikes drive over the surface, crushing and relocating artefacts.
Quartz occurs in veins in the granite, and flakes of stone are removed where the veins appear. Other stone suitable for flaking is rare in the Esperance region and was thus heavily exploited where it occurred and taken further from its source (the discard patterns of rare or introduced stones can reflect population dispersal patterns throughout regions). The quartzite quarry behind the primary dunes at Alexander Bay (W 1056) is an example. This site which is vulnerable to increased vehicular traffic is the only known quarry of this material in a 100km square, and is possibly the source of artefacts in this material which have been found over a wide distance.

5.2.2 Existing Facilities

South Alexander Bay. This is the popular camping and recreation area (Plate 4). Groups of campers pitch tents in the paperbark swamp and along the beach in an area sheltered by showy banksia.

Although this area is presently vacant Crown land the Esperance Shire has sunk bore-hole toilets, prepared a rubbish tip and provided rubbish bins. There is a problem of litter control and cutting of trees (Plate 5) which indicates the need for a Ranger during peak visitor periods. A local group generally keep the camping area clean and tidy but have no jurisdiction over people visiting the area.

Erosion of the primary dune is occurring from camping activities, cutting of vegetation for firewood and 4WD tracks leading to the beach causing blow-outs.

Alexander River. Access to the beach can be gained from the western side of Alexander River. Encroachment of the track is occurring by a large drifting sand dune. Denudation of the dune and subsequent erosion has been exacerbated by off-road vehicles (Plate 1).

Camping in this area is sporadic and less popular than the southern end of Alexander Bay. A small, protected campsite is situated near the mouth of the river. Trees and shrubs have been cut for firewood which is gradually diminishing the shelter belt.

5.2.3 Future Management

To manage and control the activities of visitors at Alexander Bay it is necessary to vest the area in a suitable Management Authority. Two groups presently carry out the required function, firstly the Esperance Shire and secondly the National Parks Authority.

Esperance Shire would be the most appropriate agency to manage the recreation area at Alexander Bay as they have shown the ability to control user activities in other recreation areas, for example the recent beach management programmes west of Esperance. Before any further development takes place, however, it will be necessary to appoint a Ranger to patrol the area. Since the area is only used on a seasonal basis at present, it would be appropriate to employ a Ranger, to patrol recreation areas east of Esperance during the summer and Easter holidays.

A small Reserve should be vested in the Shire for the purpose of camping and recreation (Figure 2). The boundaries should extend from the south eastern headland of Alexander Bay to the western side of Alexander River and extend northwards to about the scarp (approximately 2km). Specific site details of management proposals at Alexander Bay will be required before vestiture takes place.

Consideration needs to be given to the protection of the flora, fauna, landscape and aboriginal sites, as well as the future recreation potential and social requirements of this public land. In addition it is desirable that an ecological continuum exists between Cape le Grand and Cape Arid National Parks so that vegetation and wildlife populations are maintained.

In the future, the coastal recreational areas should become the responsibility of the Shire as funds become available for the provision of recreational amenities and improved road access. The remainder of the vacant Crown land may be best reserved for the Conservation of Flora and Fauna, with the proviso that access routes to the beaches are maintained.

5.2.4 Future Development

Chalet Development. The Esperance Shire Council has submitted an application on behalf of the Alexander Bay Village Association to the Department of Lands and Surveys, for the development of chalets at Alexander Bay.

A Planning Report (May 1983) was prepared by the Department of Lands and Surveys which defines the possible form of the village and the likely engineering and environmental problems that might be encountered. This report is used as a basis for a closer analysis of "the impact of development on this virtually unspoiled, dynamically balanced landscape".

The proposed chalet site is backed by a high, steep dune ridge to the south west which forms part of a recently stabilized dune system (Figure 9). Although the site is currently well vegetated and stable, loss of this protective vegetation, be it by clearing, fire or the more subtle destruction of the vegetation as a result of multiple path development, would pose a significant wind erosion problem which could be quite difficult to control.

The low depression landward of the foredune acts as a natural drainage basin and major drainage problems could arise if this area were cleared. By creating this "buffer area" and prohibiting chalets on exposed dunes the Department of Lands and Surveys' concept plan (May 1983) is reduced by approximately half. Further expansion of chalets could only occur landwards into an area where chalets would be more visually obtrusive. This area is well vegetated with a mallee community (*Eucalypt, Melaleuca, Hakea*) underlain by Pallinup siltstones.

Although in the short-term this is only seen as a small chalet development, an increase in demand for chalet-type development could put greater pressure on Alexander Bay and other isolated coastal areas to open up more areas for this type of accommodation. With this the need for conventional vehicle access and public utilities would be required. It would be undesirable for the area to develop in this manner when such facilities are already available at Duke of Orleans Bay where there is ample room for expansion with comparatively little impact on the environment.

The social impact of a chalet village would have both positive and negative aspects. By developing chalets on an individual sub-lease basis there would be a fulfilment of a demand for permanent holiday home accommodation which does not exist for Esperance people on this section of south coast. The nearest area is located at Hopetoun, over 200km west of Esperance. The sub-lease arrangement, however, does not allow for rented accommodation except on a private basis. Chalets available for rent are often in demand by tourists who do not have access to 4WD vehicles and as upgrading of access to Alexander Bay is not intended in the near future by the Shire Council then a section of the community is denied access to an accommodation type they desire.

Another aspect relates to the campers who are attracted to Alexander Bay for its induced sense of isolation. The construction of dwellings will detract from this feeling, particularly as the majority of campers interviewed at Easter (1984) requested that the area be "left as it is" (unpub. data, Department of Conservation and Environment).

Advantages of a chalet village at Alexander Bay are:-

1. providing a more substantial development in a popular fishing spot, which does not presently exist on the Esperance coast.

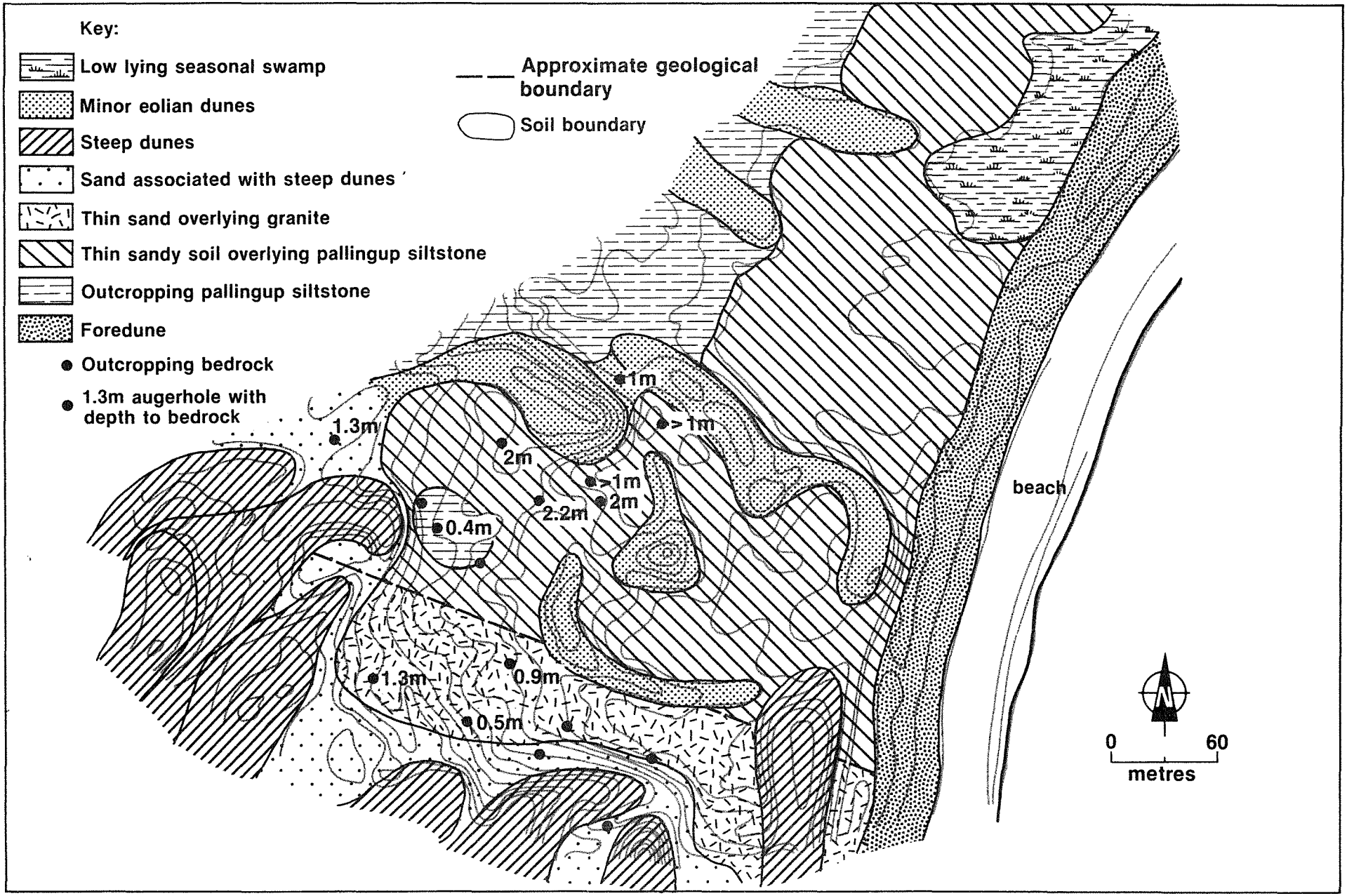

Figure 7 — Geology and Soils of Proposed Chalet Area at Alexander Bay.

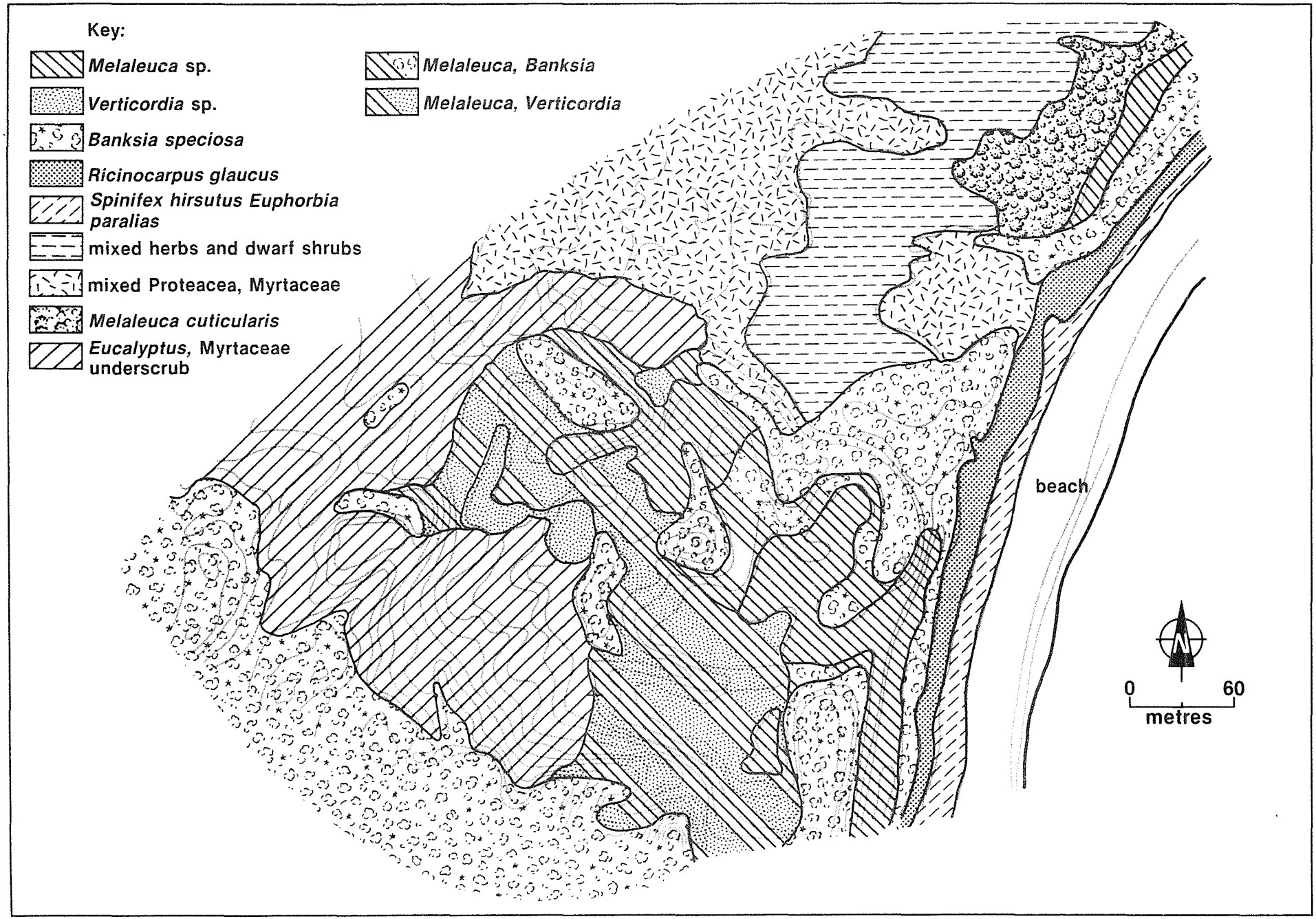

Figure 8 — Vegetation units of Proposed Chalet Area at Alexander Bay.

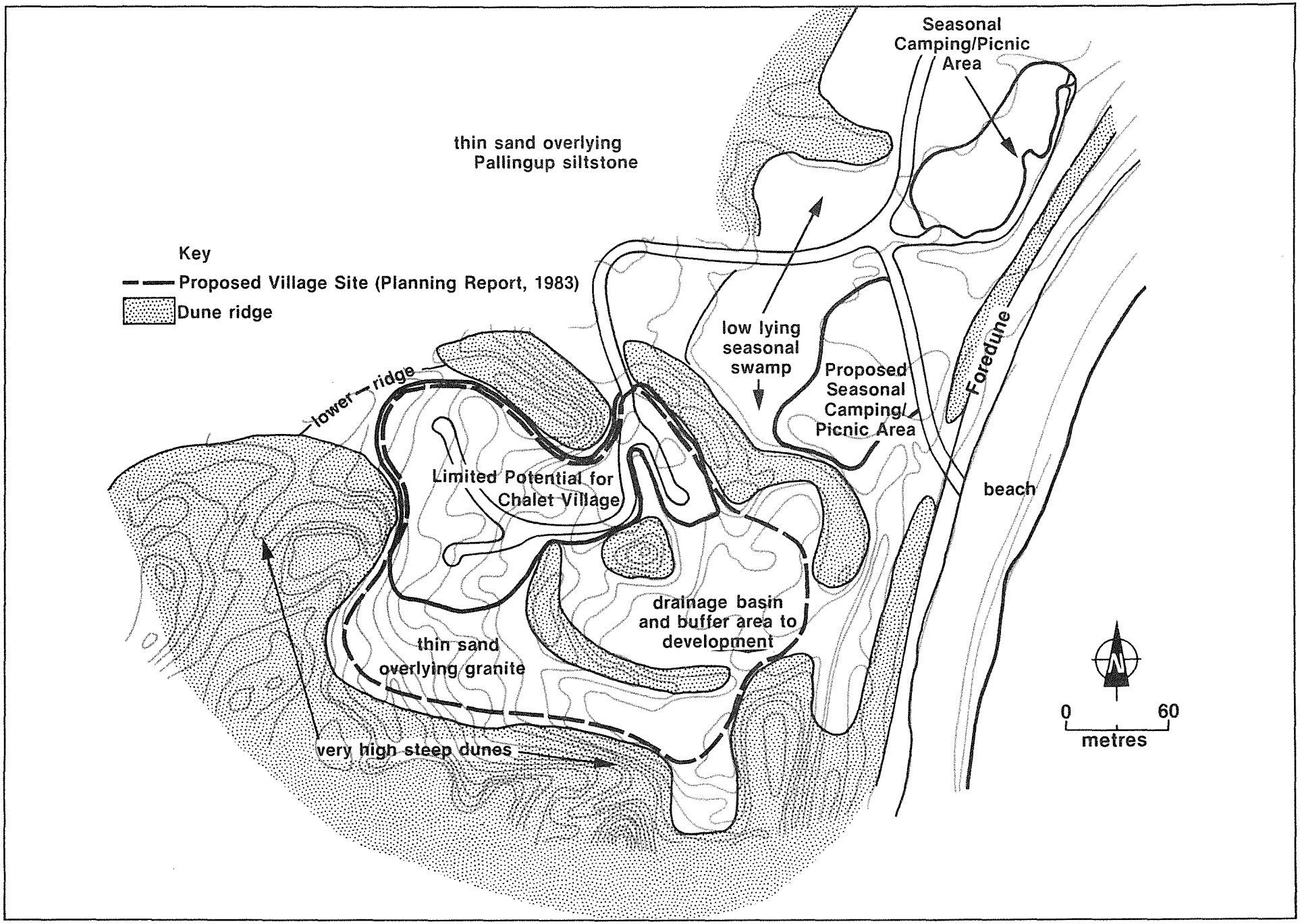

Figure 9 — Land Capability of Proposed Chalet Area at Alexander Bay.

2. the proposed chalet site is unobtrusive if it remains contained within the shallow, crescent shaped valley.

3. a village of cluster type development would reduce the impact on the environment by allowing the conservation of areas between each cluster and also the opportunity of easily staged development.

Disadvantages include:-

1. highly erodible sandy soils which depend on vegetation cover for their stability.

2. alterations in drainage patterns as a result of chalet development may cause localised problems.

3. effluent disposal over shallow granite or Pallingup siltstone basement may be a problem for septic tanks in some areas.

4. uncertain water supplies, the presence of a potable ground water supply sufficient for chalets compared to seasonal camping activities is not known.

5. distance from Esperance increases the cost of development and management.

6. the access track would need to be upgraded to cater for increased traffic to chalets, the costs of which need to be met by the Shire.

7. the proposed chalet village does not plan to provide accommodation for rent by tourists. Individually owned chalets for long-term lease make inefficient use of space and resources, particularly if they are only seasonally occupied.

8. fire is a threat to the stability of the area.

9. disease, particularly by dieback in the showy banksia could cause loss of vegetation and increase the erosion risk, particularly as this species forms the main vegetation between the chalet clusters and is in the "buffer area". Vehicle movement increases the potential for disease infestation.

In conclusion, we consider that chalets should not be developed at Alexander Bay. For long-term regional planning, Alexander Bay is not environmentally or socially suitable for chalet development, whereas potential exists at Duke of Orleans Bay and more substantial development should be encouraged there.

Low-key Camping and Picnic Sites. There is an immediate need to formalise low-key camping and picnic areas at Alexander Bay. These recreation areas are best developed as individual nodes to make use of natural features. The following areas are suitable for picnics or seasonal camping (refer to Figure 10):-

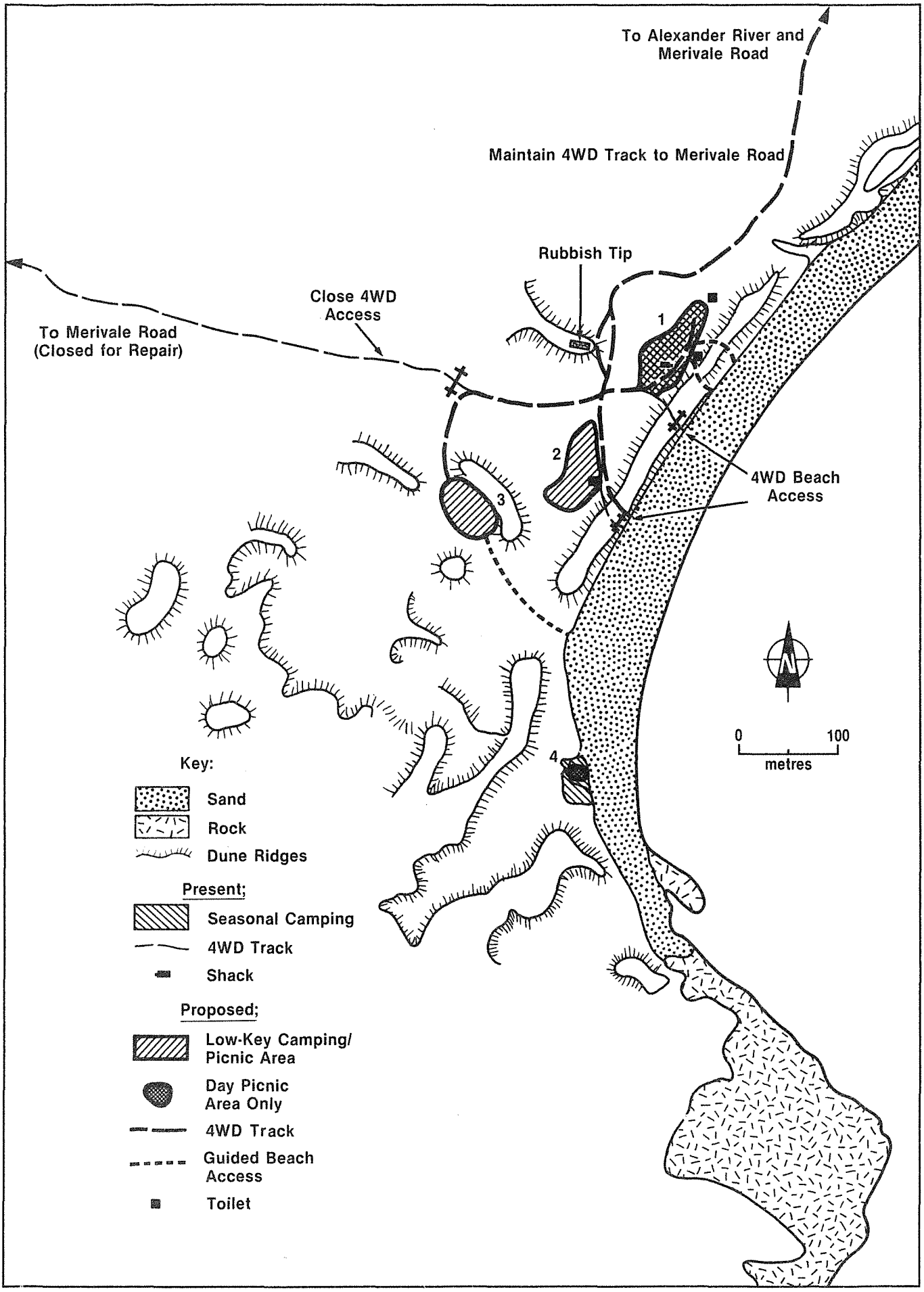

Figure 10 — Concept Diagram of Management Proposals at Alexander Bay.

1. the paperbark (*Melaleuca cuticularis*) swamp could be upgraded to accommodate about 20 sites.

2. an area of Showy Banksia (*B. speciosa*) to the south west of Area 1 for 10-20 sites.

3. a camping area in the interdunal swale for up to 30 sites could be an alternative to the proposed chalet development.

4. a picnic area in a sheltered clearing of the primary dunes. This is presently used for camping but needs to be closed off to prevent further damage to the dunes.

In the long-term Areas 1 and 2 may be more suitable for picnic areas and Area 3 used as the main camping area.

In the short-term delineation of camping sites, extra toilets, constructed fireplaces and provision of firewood, guided beach access tracks and closure of the western most access track from Alexander Road are required. A potable water supply is also favoured. Eventually an ablution block may be required if visitor pressures increase.

5.3 KENNEDY'S (BLACKBOY CREEK)

The beach to the east of Taylor Boat Harbour is locally referred to as "Kennedy's". Access to the coast is over a four wheel drive track which leads southwards from Exchange Road.

The area attracts few people as the beach and foredunes are very exposed with little shelter being afforded in the lee of the dunes or headlands (Plate 6). Kennedy's is frequented mainly by fishermen. A permanent freshwater lake on the plateau in the land to the north of Kennedy's attracts duck shooters at irregular intervals.

Due to the exposed situation of Kennedy's it is unlikely that visitor numbers will increase appreciably in the future. It would be a low priority area for any development and requires minimal management input. Fire control in the hinterland of Kennedy's and Blackboy Creek is the main management requirement at present.

At this stage, due to the low visitor pressure and the minimal degradation to the environment from human activities, the area would best be retained as vacant Crown land. The coastal recreation area should become the responsibility of the Shire as funds become available for provision of recreation amenities and improved road access. In the future, a management plan would need to be developed which takes into account the flora, fauna and aboriginal sites within the area.

Plate 6 - View of Kennedy's Beach.

ACKNOWLEDGEMENTS

Mr W McArthur has helped in the preparation of the geological and landforms sections of the report, and Mr A Daw compiled the list of birds of the Esperance region.

We would like to thank the rangers of Cape Arid National Park, Esperance Shire Council, Orleans Bay Caravan Park and Esperance citizens who distributed the questionnaire for the recreation survey. Appreciation is also given to the visitors and people in the community who completed the questionnaire. Assistance was given by Mr A Moore for the aerial survey. Mr D Grinceri assisted in data collation and presentation of the survey results.

Thanks are also due to Mr B Stewart for report preparation and Mr T Berman and Ms C Hofstee for artwork, and the typists F Mackenzie, Mrs H Hunt and Mrs D Balasubramaniam.

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Appendix 1 - WILDLIFE LISTS FOR THE ESPERANCE EAST COAST

1.1 List of mammals from cave deposits near Marbellup Hill and Mount Arid (by A. Baynes, Reaearch Associate, Western Australian Museum)

Species	near Marbellup Hill	Mount Arid
Western Quoll (*Dasyurus geoffroii*)	X	.
Dibbler (*Antechinus apicalis*)	X	X
White-tailed Dunnart (*Sminthopsis granulipes*)	X	X
Common Dunnart (*Sminthopsis murina*)	X	X
Southern Brown Bandicoot (*Isoodon obesulus*)	X	X
Common Ringtail Possum (*Pseudocheirus peregrinus*)	.	X
Western Pygmy-possum (*Cercartetus concinnus*)	X	X
Broad-faced Potoroo (*Potorous platyops*)	X	X
Brush-tailed Bettong (*Bettongia penicillata*)	X	X
Black-footed Rock-wallaby (*Petrogale lateralis*)	X	.
Tammar Wallaby (*Macropus eugenii*)	X	.
Western Grey Kangaroo (*Macropus fuliginosus*)	X	.
Dingo (*Canis familiaris*)	X	.
Ash-grey Mouse (*Pseudomys albocinereus*)	X	X
Western Mouse (*Pseudomys occidentalis*)	X	X
Heath Mouse (*Pseudomys shortridgei*)	X	X
hopping-mouse (?Mitchell's) (*Notomys* sp.)	X	X
Bush Rat (*Rattus fuscipes*)	X	X
European Rabbit (*Oryctolagus cuniculus*)	X	.

X = recorded . = not recorded

Appendix 1.2

Bird Sightings in Cape le Grand National Park
(from Kitchener, Chapman and Dell, 1975 and National Parks Survey, 1979 unpublished data)

EMU	-
PENGUIN	- Little
GREBE	- Hoary Headed Little
ALBATROSS	- Wandering Black-browed Yellow-nosed Black-faced
CORMORANT	- Black Little Black Little Pied
PETREL	- Northern Giant Great Winged
DARTER	-
STORM PETREL	- White-faced
HERON	- White-faced Nankeen Night
DUCK	- Black Mountain Musk
TEAL	- Grey Chestnut
GOOSE	- Cape Barren
SHEARWATER	- Fleshy footed Short-tailed Little
KITE	- Black-shouldered Whistling
EAGLE	- Wedge-tailed
SEA EAGLE	- White-breasted
GANNET	- Australian
HARRIER	- Swamp
FALCON	- Brown Little Peregine
KESTREL	- Nankeen
QUAIL	- Painted
SWAMPHEN	-
CRAKE	- Spotted
BUSTARD	- Australian
OYSTERCATCHER	- Pied Sooty
AVOCET	-
DOTTEREL	- Red-capped Hooded Red-kneed
GULL	- Silver Pacific
STINT	- Red-necked
TERN	- Caspian Fairy Crested
SANDPIPER	- Common
TATTLER	- Grey-tailed
PIGEON	- Common Bronzewing Crested
FROGMOUTH	- Tawny
NIGHTJAR	- Spotted
COCKATOO	- White-tailed Black
LORIKEET	- Purple-crowned
PARROT	- Rock Port Lincoln Elegant
SWIFT	- Fork-tailed
SWALLOW	- Welcome
PIPIT	- Australian
MARTIN	- Tree
CUCKOO SHRIKE	- Black-faced
WARBLER	- Reed
THORNBILL	- Broad-tailed
SCRUB-WREN	- Spotted
WREN	- Field
WAGTAIL	- Willie
ROBIN	- Hooded
PARDALOTE	- Spotted Striated
CHAT	- White-fronted
SILVEREYE	- Western
HONEYEATER	- Brown Singing White-naped White-fronted New Holland Tawny crowned
SPINEBILL	- Western
CUCKOO	- Fan-tailed
MINER	- Yellow-throated
FIRETAIL	- Red-eared
WATTLE-BIRD	- Little
MAGPIE	- Western
RAVEN	- Australian
CROW	- Little
BUTCHER BIRD	- Grey
EMU-WREN	- Southern
WOODSWALLOW	- Masked Dusky

Appendix 1.3

Bird Sightings Within 100 Miles East and West of Esperance (Daw, 1984, pers. comm.)

* denotes known to Breed in the area

*	EMU	-
*	GREBE	- Great Crested
*		Hoary Headed
*		Little (Australian)
*	PENGUIN	- Little
		Rock Hopper (very rare visitor)
	ALBATROS	- Black Browed
		Yellow Nosed
		White Capped
	PETREL	- Northern Giant
	PRION	- Slender billed
*	SHEARWATER	- Flesh Footed
*		Short Tailed
		Fluttering
*		Little
	STORM PETROL	- Wilsons
*		White Faced
	PELICAN	
	GANNET	- Australian
	DARTER	
*	CORMORANT	- Black Faced
		Pied
*		Little Pied
*		Black
*		Little Black
	GREATER FRIGATE BIRD	(rare visitor)
	HERON	- White necked (or Pacific)
*		White Faced
	EGRET	- Cattle
*		Large
	REEF HERON	
	NIGHT HERON	
	BITTERN	- Brown
	IBIS	- White
	SPOONBILL	- Yellow billed
*	SWAN	- Black
*	GOOSE	- Cape Barron (on nearby islands)
*	SHILLDUCK	- Chestnut
*	DUCK	- Black
*	TEAL	- Grey
*		Chestnut
*	SHOVELLER	- Blue Wing
*	DUCK	- Pink Eared
*		White Eyed
*		Wood
*		Blue Billed
*		Musk
*	OSPREY	
*	KITE	- Black Shouldered
		Black
		Square Tailed

Appendix 1.3 (Cont'd)
Bird Sightings

*	Kite	- Whistling
*	GOSHAWK	- Brown
*	SPARROWHAWK	- Collared
*	SEA EAGLE	- White Breasted
*	EAGLE	- Wedgetailed
*		Little
*	HARRIER	- Spotted
*		Swamp
*	FALCON	- Brown
*		Peregrine (generally nests on Islands)
*		Little
*	KESTREL	- Nankeen
*	QUAIL	- Stubbe
*		Brown
*		Painted
	RAIL	- Chestnut
*		Marsh Crake
		Spotted
*		Spotless
*	NATIVE HEN	- Black Tailed
*	MOREHEN	- Dusky
*	SWAMPHEN	
*	COOTE	
*	BUSTARD	
*	OYSTERCATCHER	- Sooty
*		Pied
*	LAPWING	- Banded
	PLOVER	- Grey
		Eastern Golden
		Red Kneed
*		Hooded
		Mongolian
		Large Billed
*		Red Capped
*		Black Fronted
*		Australian
	STILT	- Black Backed
		Banded
	AVOCET	
	TURNSTONE	
	GODWIT SANDPIPER	- Black Tailed
		Bar Tailed
		Red Knot
		Great Knot
		Sharp Tailed
		Red Knecked Stint
		Curlew Sandpiper
		Sanderling
		Broad Billed
	SANDPIPER	- Curlew
		Whimbrell
		Wood Sandpiper
		Grey Tattler
		Common Sandpiper
		Greenshark

Appendix 1.3 (Cont'd)
Bird Sightings

	SANDPIPER (Cont'd)		Marsh Sandpiper
			Terek Sandpiper
	SKUA	-	Great
	GULL	-	Silver
			Pacific
	TERN	-	Whiskered
			Gull Billed
*			Caspian
			Common
*			Fairy
*			Crested
*	PIDGEON	-	Common Bronzewing
			Brush Bronzewing
*			Crested Pidgeon
	LORIKEET	-	Purple Crowned
	GROUND PARROT		
	BUDGERIGAH		(possible escapee)
	PARROT		
	ROSELLA AND ALLIES	-	Red capped
			Port Lincoln
			Rock
	COCKATOO	-	White Tailed Black
*	PARASITIC CUCKOO	-	Pallid
*			Fantailed
*			Rufous Tailed
*			Shining Bronze
*	OWLS	-	Barn
			Barking
*	FROGMOUTH	-	Tawney
*	KINGFISHER	-	Sacred
	BEE EATER		
	SWALLOW	-	White Backed (rarely seen)
*			Welcome
*			Tree Martin
*			Fairy Martin
*	CUCKOO SHRIKE	-	Black Faced
*	TRILLER	-	White winged
	ROBIN	-	Hooded
	WHISTLER	-	Golden
*	STRIKE THRUSH	-	Grey
	BELLBIRD	-	Crested
	JACKY WINTER		
*	FLYCATCHER	-	Restless
*	FANTAIL	-	Grey
*	WILLIE WAGTAIL		
	QUAIL THRUSH	-	Cinnamon
*	BABBLER	-	White Browed
	WARBLER	-	Clamorous Reed
	LITTLE GRASSBIRD		
	SONGLARK	-	Rufous
			Brown
	WREN	-	Blue breasted
*	WREN	-	Southern Emu
	SCRUBWREN	-	White Browed
	HYLACOLA		

Appendix 1.3 (Cont'd)
Bird Sightings

	WREN	-	Field
	WEEBILL		
	WESTERN WARBLER		
*	THORNBILL	-	Broad Tailed
*			Yellow Rumped
	SITTELA	-	Varied
*	WATTLEBIRD	-	Red
*			Little
	HONEYEATER	-	Spiney Cheeked
*	MINER	-	Yellow Throated
*	HONEYEATER	-	Singing
			White Eared
			Purple Gaped
			Yellow Plumed
			Brown Headed
			White Naped
*			Brown
*			New Holland
			White Cheeked
			White Fronted
*			Tawney Crowned
			Western spinebill
			Crimson Chat
*			White Fronted
	MISTLETOE BIRD		
	PARDOLOTE	-	Yellow Rumped
			Striated
	SILVER EYE		
	FINCH (FIRETAIL)	-	Red Eared
	MAGPIE LARK		
	WOODSWALLOW	-	Masked (infrequent visitor)
*			Dusky
*	BUTCHERBIRD	-	Grey
*	MAGPIE	-	Australian
*	CURRAWONG	-	Grey
*	RAVEN	-	Australian
	CROW	-	Little

Appendix 1.4

Reptiles and Frogs in Cape Le Grand National Park
(from Kitchener, Chapman and Dell, 1975)

GEKKONIDAE (Geckoes)

Phyllodactylus marmoratus
Phyllurus milii
Diplodactylus spinigerus

PYGOPODIDAE (Legless Lizards)

Pygopus lepidopodus
Delma sp.
Aprasia striolata glauerti

AGAMIDAE (Dragon Lizards)

Amphibolurus ornatus
Amphibolurus minor
Amphibolurus adelaidensis

SCINCIDAE (Skink Lizards)

Hemiergis peroni
Lerista microtis
Lerista distinguenda
Leiolopisma trilineatum
Morethia obscura
Egernia nitida
Egernia multiscutata bos
Egernia kingii
Ctenotus gemmula
Ctenotus catenifer
Ctenotus labillardierii
Tiliqua rugosa
Tiliqua occipitalis
Menetia greyii

VARANIDAE (Goannas)

Varanus gouldii

TYPHLOPIDAE (Blind Snakes)

Typhlina australis

BOIDAE (Pythons)

Python spilotus

ELAPIDAE (Back fanged snakes)

Denisonia coronata
Brachyaspis curta
Notechis scutatus
Demansia affinis

HYLINAE (Tree Frogs)

Litoria cyclorhyncha
Litoria adelaidensis

LEPTODACTYLIDAE (Ground Frogs)

Limnodynastes dorsalis
Heleioporus eyrei
Crinia georgiana
Crinia pseudinsignifera

Appendix 1.5

Survey of Invertebrate Fauna in Cape le Grand National Park, 1977 (National Parks Authority, unpublished data).

Arthropoda

A. Crustacea

Isopoda
Phreatoicoidea - Phreatoicopsidae
Amphipoda - Gammaridae
Ceinidae

B. Myriapoda

Chilopoda -
Scutigeridae
Lithobiidae
Scolopendridae
Geophilidae
Diplopoda -
Chilognatha

C. Arachnida

Scorpionida (Scorpions)
Urodacus novaehollandiae
Chelonethida (Pseudoscorpions)
Garypidae - *Synsphyrouus* sp.
Araneae (Spiders)
Acarina (Mites, Tcks, Watermites)

D. Collembola

Sminthuridae - *Katianna* sp.
Sminthurinus sp.
Entomobryidae - *Willowsia* (?)
Isotomidae - *Isotoma tridentifera* (?)
Neanuridae - *Pseudachorutella*

E. Insecta

Apterygota -
Archaeognatha - Meinertellidae
Thysanura - Ateluridae
- Lepismatidae
Pterygota -
Odonata - Gomphidae
- Aeshnidae
- Coenagrionidae
Blattodea - Blattidae
- Polyzosteria sp.
Isoptera -
Mantodea - Mantidae
Dermaptera - Forficulidae
Orthoptera - Acrididae
- Myrmecophilidae
- Gryllidae

Appendix 1.5 (Cont'd)
Survey of Invertebrate Fauna

Hemiptera	- S.O. Homoptera
	- Fulgoridae
	- Eurymelidae
	- S.O. Heteroptera
	- Reduviidae
	- Pentatomidae
	- Scutelleridae
Thysanoptera	-
Neuroptera	-
Coleoptera	- Carabidae
	- Gyrinidae
	- Dytiscidae
	- Hydrophilidae
	- Scydmaenidae
	- Staphylinidae
	- Pselaphidae
	- Geotrupidae
	- Scarabaeidae
	- Rhipiceridae
	- Elateridae
	- Dermestidae
	- Nitidulidae
	- Coccinellidae
	- Tenebrionidae
	- Chrysomelidae
	- Curculionidae
	- Cerambycidae
Diptera	- Tachinidae
	- Tabanidae
	- Asilidae
	- Tipulidae
Trichoptera	-
Lepidoptera	-
Hymenoptera	-

Mollusca

Bothryembryon sp.
Westralaoma sp.
Tatea sp.
Testacella sp.

APPENDIX 2 - ABORIGINAL SITES IN THE EASTERN SOUTH COAST

2.1 Aboriginal Sites Survey in Crown Land Between Cape le Grand and Cape Arid National Parks (by M. Smith, Western Australian Museum).

Ref. No.	W.A.M. Site Register No.	Site Name
1	W 1055	Mount Belches West
2	W 0610	Mount Belches South
3	W 1220	Mount Belches South Quarry
4	W 1221	Mount Belches South Hill
5	W 1149	Nares Beach Granite Boulder
6	W 1150	Nares Beach Quartz Quarry
7	W 1273	Duke of Orleans Bay E
8	W 1272	Duke of Orleans Bay D
9	W 1271	Duke of Orleans Bay C
10	W 1270	Duke of Orleans Bay B
11	W 1269	Duke of Orleans Bay A
12	W 1268	Duke of Orleans Bay 3
13	W 1266	Duke of Orleans Bay 1
14	W 1267	Duke of Orleans Bay 2
15	W 1264	Dailey River
16	W 1263	West Dailey 1
17	W 1262	West Dailey 2
18	W 1265	Seaside Site 1
19	W 1275	Duke Headland 2
20	W 1274	Duke Headland 1
21	W 1276	Mungliginup Creek Hill
22	W 1277	Mungliginup Creek East
23	W 1278	Mungliginup Beach Blowout
24	W 1279	Membinup West Hilltop
25	W 1280	Membinup Spring
26	W 1184	Alexander Bay West
27	W 1212	Alexander Bay Campsite
28	W 1185	Alexander Bay Ridge
29	W 0807	Alexander River
30	W 1056	Alexander River Quarry
31	W 1213	Alexander Point Quarry
32	W 0545	Headland
33	W 0546	Sandhill
34	W 0547	Blackboy Creek
35	W 0551	Chert Source
36	W 0549	Mortup Hill

Appendix 2 (Cont'd)

2.2 Aboriginal Sites, Aboriginal Heritage Act, 1972-1980

Places associated with, or significant to, Aboriginal people are classified as sites, and are protected under the Aboriginal Heritage Act 1972-1980 which defines them in Section 5 as:

"(a) any place of importance and significance where persons of Aboriginal descent have, or appear to have, left any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with the traditional cultural life of the Aboriginal people, past or present;

(b) any sacred, ritual or ceremonial site, which is of importance and specific significance to persons of Aboriginal descent;

(c) any place which, in the opinion of the Trustees, is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State;

(c) any place where objects to which this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or removed."

Appendix 2.3

Obligations Relating to Sites Under the Aboriginal Heritage Act 1972-1980

"Report of Findings

15. Any person who has knowledge of the existence of any thing in the nature of Aboriginal burial grounds, symbols or objects of sacred, ritual or ceremonial significance, cave or rock paintings or engravings, stone structures or arranged stones, carved trees, or of any other place or thing to which this Act applies or to which this Act might reasonably be suspected to apply shall report its existence to the Trustees, or to a police officer, unless he has reasonable cause to believe the existence of the thing or place in question to be already known to the Trustees.

Excavation of Aboriginal Sites

16. (1) Subject to Section 18, the right to excavate or to remove any thing from an Aboriginal site is reserved to the Trustees.

(2) The Trustees may authorise the entry upon and excavating of an Aboriginal site and the examination of removal of any thing on or under the site in such manner and subject to such conditions as they may direct.

Offences Relating to Aboriginal Sites

17. A person who -

(a) excavates, destroys, damages, conceals or in any way alters any Aboriginal site; or

(b) in any way alters, damages, removes, destroys, conceals, or who deals with in a manner not sanctioned by relevant custom, or assumes the possession, custody or control of, any object on or under an Aboriginal site, commits an offence unless he is acting with the authorisation of the Trustees under Section 16 or the consent of the Minister under Section 18.

Consent to Certain Uses

18. (1) For the purposes of this section, the expression "the owner of any land" includes a lessee from the Crown, and the holder of any mining tenement or mining privilege, or of any right or privilege under the Petroleum Act 1967, in relation to the land.

(2) Where the owner of any land gives to the Trustees notice in writing that he requires to use the land for a purpose which, unless the Minister gives his consent under this section, would be likely to result in a breach of Section 17 in respect of any Aboriginal site that might be on the land, the Trustees shall, as soon as they are reasonably able, form an opinion as to whether there is any Aboriginal site on the land, evaluate the importance and significance of any such site, and submit the notice to the Minister together with their recommendation in writing as to whether or not the Minister should consent to the use of the land for that purpose, and, where applicable, the extent to which and the conditions upon which his consent should be given.

(3) Where the Trustees submit a notice to the Minister under subsection (2) of this section he shall consider their recommendation and having regard to the general interest of the community shall either -

(a) consent to the use of the land the subject of the notice, or a specified part of the land, for the purpose required, subject to such conditions, if any, as he may specify; or

(b) wholly decline to consent to the use of the land the subject of the notice for the purpose required,

and shall forthwith inform the owner in writing of his decision.

(4) Where the owner of any land has given to the Trustees notice pursuant to subsection (2) of this section and the Trustees have not submitted it with their recommendation to the Minister in accordance with that subsection the Minister may require the Trustees to do so within a specified time, or may require the Trustees to take such other action as the Minister considers necessary in order to expedite the matter, and the Trustees shall comply with any such requirement.

(5) Where the owner of any land is aggrieved by a decision of the Minister made under subsection (3) of this section he may, within the time and in the manner prescribed by rules of court, appeal from the decision of the Minister to the Supreme Court which may hear and determine the appeal.

(6) In determining an appeal under subsection (5) of this section the Judge hearing the appeal may confirm or vary the decision of the Minister against which the appeal is made or quash the decision and substitute his own decision which shall have effect as if it were the decision of the Minister, and may make such order as to the costs of the appeal as he sees fit.

(7) Where the owner of any land gives notice to the Trustees under subsection (2) of this section, the Trustees may, if they are satisfied that it is practicable to do so, direct the removal of any object to which this Act applies from the land to a place of safe custody.

(8) Where consent has been given under this section to a person to use any land for a particular purpose nothing done by or on behalf of that person pursuant to, and in accordance with any conditions attached to, the consent constitutes an offence against this Act."

APPENDIX 3

Eastern South Coast — Recreation Survey

This questionnaire is devised to provide information which will assist in planning tourist facilities for the coast east of Esperance.

QUESTIONNAIRE

(Please tick appropriate boxes)

1. How many people in your group? .....

2. How many vehicles in your group? .....

3. What town or area do you come from? .....

4. Are you using 4WD or 2WD vehicles? ☐ 4WD ☐ 2WD

5. Where are you staying?

   ☐ Cape le Grande National Park
   ☐ Kennedy's Beach
   ☐ Duke of Orleans Bay
   ☐ Cape Arid National Park
   ☐ Membinup Beach
   ☐ Thomas River (Shire Reserve 518)
   ☐ Alexander Bay

6. What is your accommodation type?

   ☐ tent ☐ on-site van ☐ other
   ☐ own caravan ☐ chalet

7. How long are you staying in the area?

   ☐ day-trip ☐ overnight ☐ more than 1 night

8. How often do you visit the area?

   ☐ 1st visit ☐ regular basis ☐ infrequent

9. What activities do you take part in?

   ☐ Beach fishing ☐ Walking ☐ Pleasure driving
   ☐ Ocean fishing ☐ Nature Study ☐ Picnic
   ☐ Swimming ☐ Trail bikes/buggies ☐ Other .....
   ☐ Diving

10. Where are your favourite places for day-trips?

    ☐ Cape le Grande National Park
    ☐ Alexander Bay
    ☐ Wharton Beach
    ☐ Kennedy's Beach
    ☐ Duke of Orleans Bay
    ☐ Thomas River
    ☐ Membinup Beach
    ☐ Cape Arid National Park

11. What do you like about the area? .....

    .....

12. What improvement would you like to see? .....

    .....

    .....

    .....

    .....

    .....

We acknowledge the assistance of Rangers of Cape Arid National Park, Esperance Shire Council, Esperance Tourist Bureau

seal here

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BUSINESS REPLY POST
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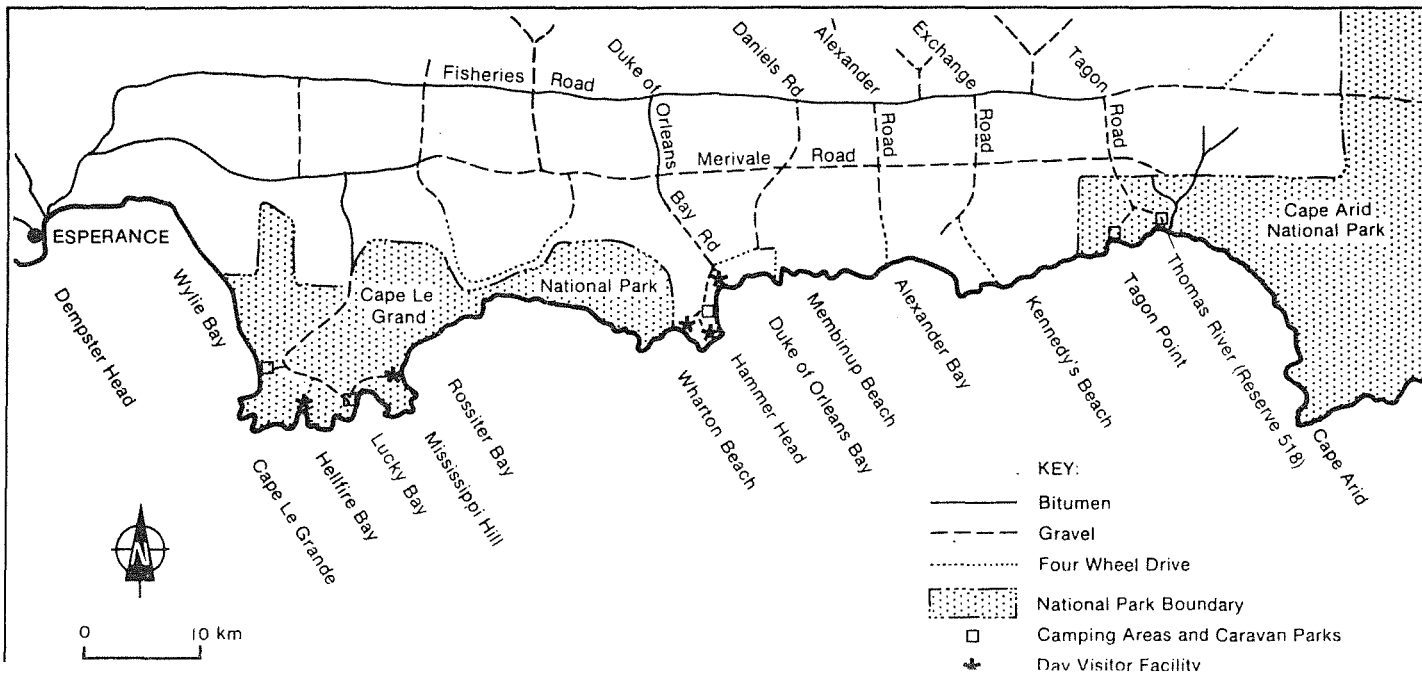
B.P. House,
1 Mount Street,
PERTH, W.A. 6000

Second Fold

PLEASE RETURN YOUR COMPLETED FORM TO STAFF IN THE PARK OR FOLD WHERE INDICATED AND MAIL (POSTAGE PAID) TO THE ABOVE ADDRESS

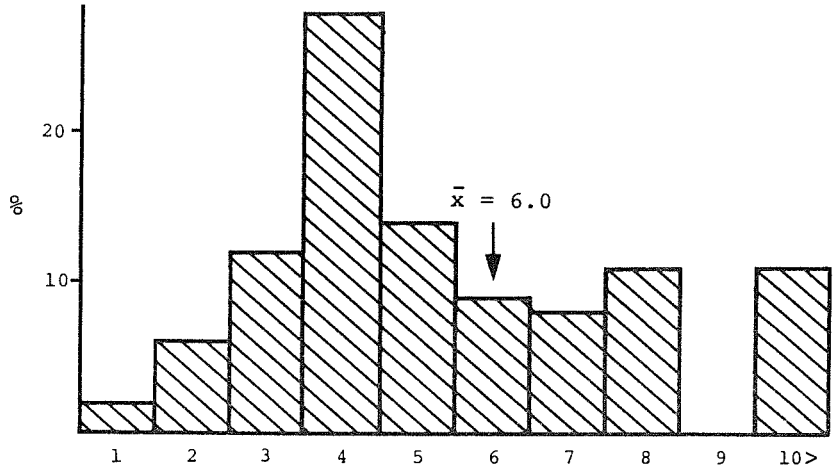
First Fold



Appendix 3.2

Summary of Results from the Eastern South Coast Recreation Survey, Easter Break, 1984

Q1. Number of people per group



Q2. Number of vehicles per group

No. Vehicles in Group	No.	%
1	21	33
2	26	41
3	10	16
4	6	10
	63	100

Q3. Home locality of respondents

Area Category	No.	%
Esperance Area	25	38
Goldfields Area	26	39
South-west W.A.	4	6
Perth	5	8
Other W.A.	2	3
Interstate	4	6
	66	100

Appendix 3.2 (Cont'd)

Q4. Type of vehicle used

Type	No.	%
4WD	48	61
2WD	31	39
	79	100

Q5. Location of accommodation

Location	No.	%
Cape le Grand National Park	1	2
Duke of Orleans Bay	29	44
Membinup Beach	0	0
Alexander Bay	19	29
Kennedy's Beach	2	3
Cape Arid National Park	2	3
Thomas River (Reserve 518)	8	12
Other	5	7
	66	100

Q6. Accommodation facility

Type	No.	%
Tent	40	44
Own Caravan	23	25
On-site Van	10	11
Chalet	3	4
Other	15	16
	91	100

Q7. Length of stay

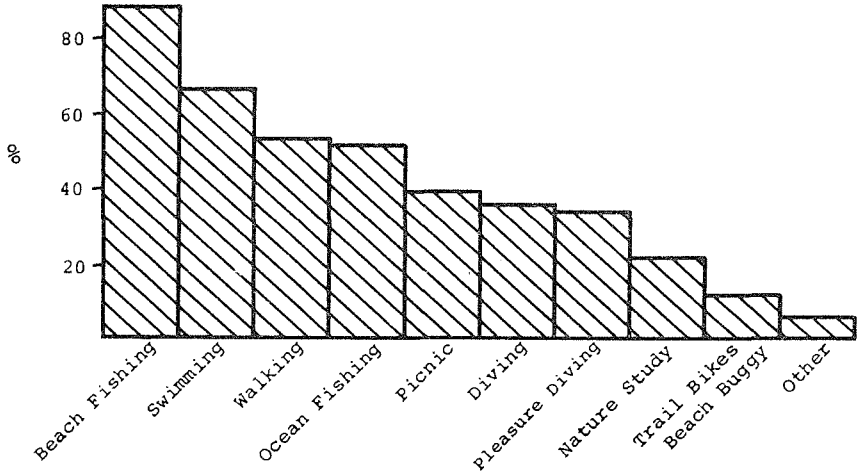
Length of Stay	No.	%
Day trip	2	3
Overnight	2	3
>1 night	60	94
	64	100

Appendix 3.2 (Cont'd)

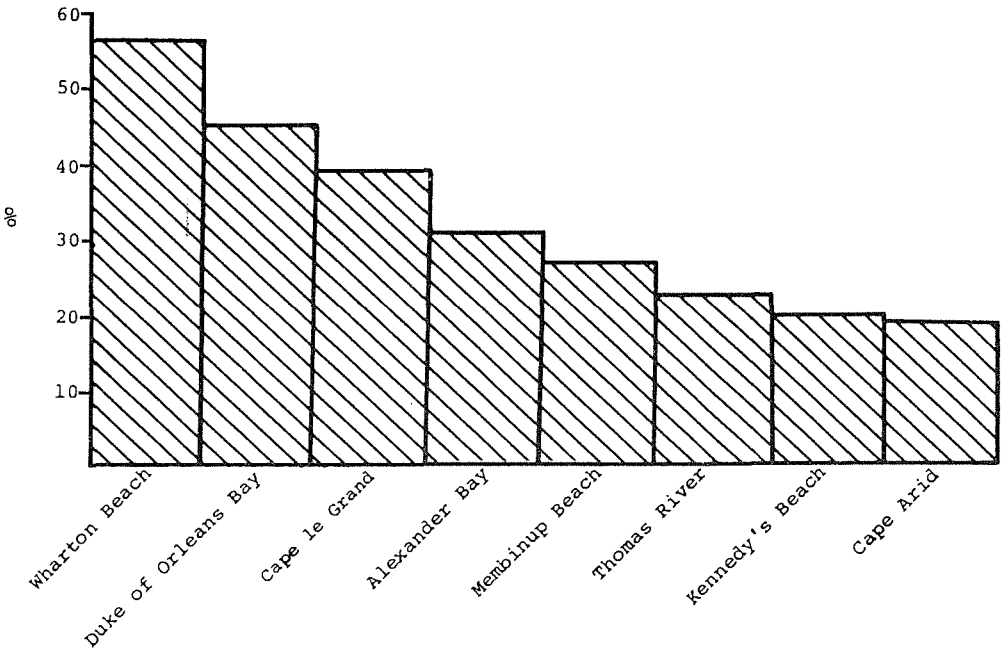
Q8. Frequency of visits

No. of Visits	No.	%
1st Visit	11	17
Regular Basis	37	58
Frequent	16	25
	64	100

Q9. People's activities

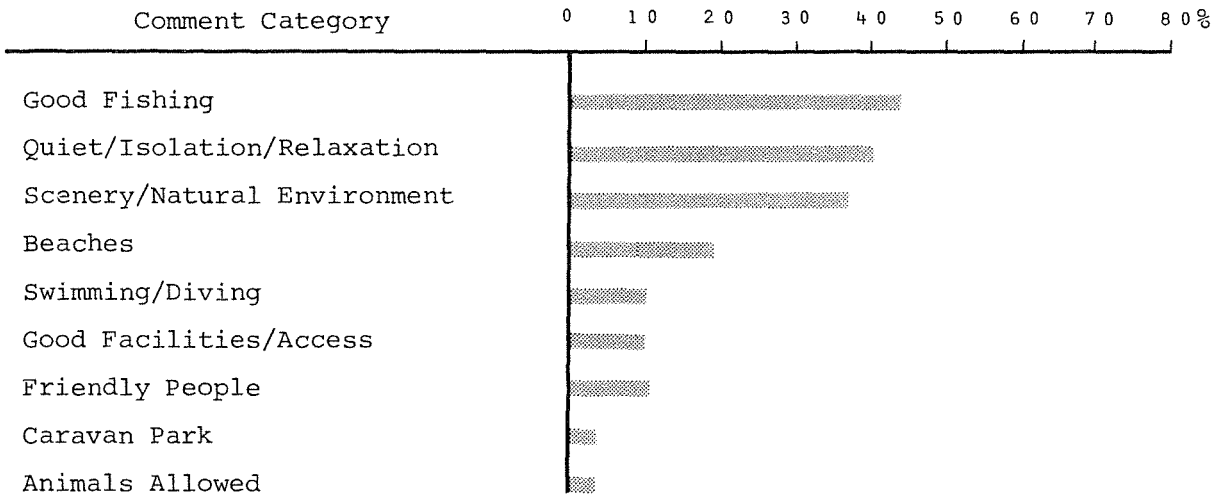


Q10. Favoured locations for day trips

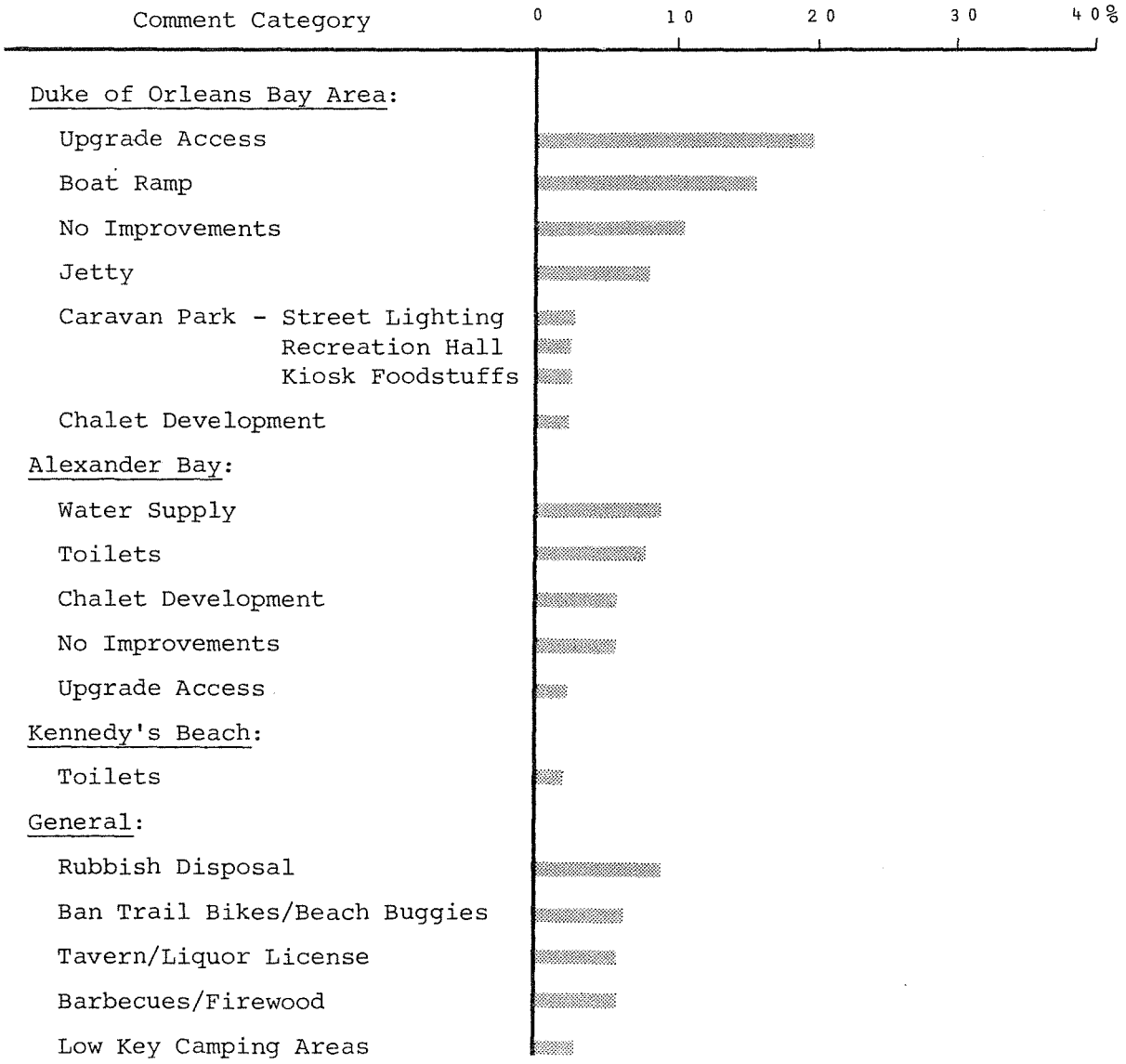


Appendix 3.2 (Cont'd)

Q11. The attractions



Q12. Suggested improvements



Appendix 3.3

Vehicle Count from Aeiral Photographs Saturday 21 April, 1984
9.00 a.m. - 10.00 a.m.

	Vehicles	Boats	Caravans Camper Vans Shacks	Tents
Cape le Grand National Park				
Lucky Bay	22	3	12	5
Rossiter Bay	2			
Dunns Rock	9	1		10
Cheyne Point	1			
Duke of Orleans Bay				
Nares Island	8	3	6	2
Orleans Bay	58	10	50	16
Table Island	3			1
Membinup Point	6	2	2	3
Alexander Bay	11	5	1	15
Kennedy's (Blackboy Creek)	2			2
Thomas River				
Reserve 518	5			9
Cape Arid National Park	2			4