THE NATURE CONSERVATION VALUES OF THE FORTESCUE BAY AREA

AND THE POTENTIAL IMPACT OF INCREASED VISITOR NUMBERS

October 2000

Prepared by Reserve Design & Management (RD&M)

For Department of Primary Industries, Water and Environment

Acknowledgements

We're grateful for the assistance of Vicky Shilvock and Annie McCuaig of the DPIWE. Also the members of Nature Conservation Branch who have contributed to compiling this document.

RD&M Work group

Phil Bell	Fauna & habitat
Greg Blake	Project management / Ecology
Phil Cullen	Flora
Matt Dell	GIS / Geomorphology
Sophie Underwood	Editing

Table of contents

Executive summary and Recommendations

The area considered in this report includes Fortescue Bay, Canoe Bay and Bivouac Bay and the surrounding existing Visitor Services section of the Tasman National Park in South-Eastern Tasmania.

Summary of Nature Conservation Values

The area possesses significant nature conservation values:

The sum of these values is sufficient to warrant the protection of the area from future impacts.

Values include vegetation communities that are of significance to the Tasmanian Regional Forest Agreement and other non forest communities which are of extremely high significance on a regional scale. Coastal communities particularly are of significance as they are under threat or extensively degraded on a State wide basis

The area also contains habitat for fauna and faunal communities that are of important at Regional, State and National scales.

Also of significance are several Geomorphological features that that are currently in very good condition and which represent types that are under threat in other parts of the State. This is particularly true of features of Fortescue Bay Beach which represents the only beach of its type in South-Eastern Tasmania that is in good condition and subject to secure protection from future degradation.

The area, particularly the beach at Fortescue Bay, is of regional significance as it is representative of a landscape that is threatened in the South East of Tasmania. This significance is recognised by the listing of Fortescue Bay as an indicative place for inclusion on the Register of the National Estate.

The nature conservation values of the area are discussed in more detail in the body of this report.

Threats to the Nature Conservation Values of the area

Threats to the area from future developments fall into three categories:

Firstly current usage, while largely benign, does place some stress on the area. Also certain land management issues are in need of attention including the elimination of some, currently minor but potentially more significant weed species. Mitigation of this category of threat is important if the integrity of the area is to be maintained.

Secoendly are threats to specific values that would be directly impacted by any development. This report provides specific recommendations in relation to the siting of any proposed development and discussions in relation to appropriate restrictions in this regard.

The final category of impacts is related to the more dispersed consequences of a general increase of visitor numbers within the area. Increased visitor numbers would have significant impacts on the broad range of values of the area and could induce significant systemic degradation.

Recommendations

As a consequence of these threats the current Visitor Services Zone should be reduced in area to that which is indicated on Map 4. The balance of the study area should be re-zoned Protection 1 as per the Draft Land Management Zoning Guidelines (DPWIE 2000, under consideration).

Future developments should be restricted to the area indicated on Map 4 as the proposed new Visitor Services Zone. Within this area developments must respond to restrictions, discussed elsewhere in this report, that will reduce local impacts. Developments outside this zone are incompatible with the maintenance of values and should be disallowed, this includes the closure and rehabilitation of the existing Standing Camp at Bivouac Bay.

Every attempt should be made to reduce the impact of visitors on the values of the area. This would include appropriate interpretation, hardening of access tracks and control of drainage and other hydrological impacts.

As current impacts to the area are relatively limited any increase in visitor numbers should be subject to a detailed monitoring campaign. This report should form the basis of these monitoring activities but fixed monitoring sites must be established to determine future impacts.

There are several issues that currently need addressing in relation to the impacts of existing usage of the area and other existing threats. These include the elimination of weed infestations, particularly Marrum Grass infestations in the fore-dune area of Fortescue Bay. Also access to the beach should be rationalised and access trails hardened. . With relatively limited expenditure of recourses the area could be restored to excellent condition (Condition 1 as per this report) and maintained as such.

Even if current usage levels are to be maintained interpretation of the nature conservation values of the area needs to be improved to reduce co-incidental damage.

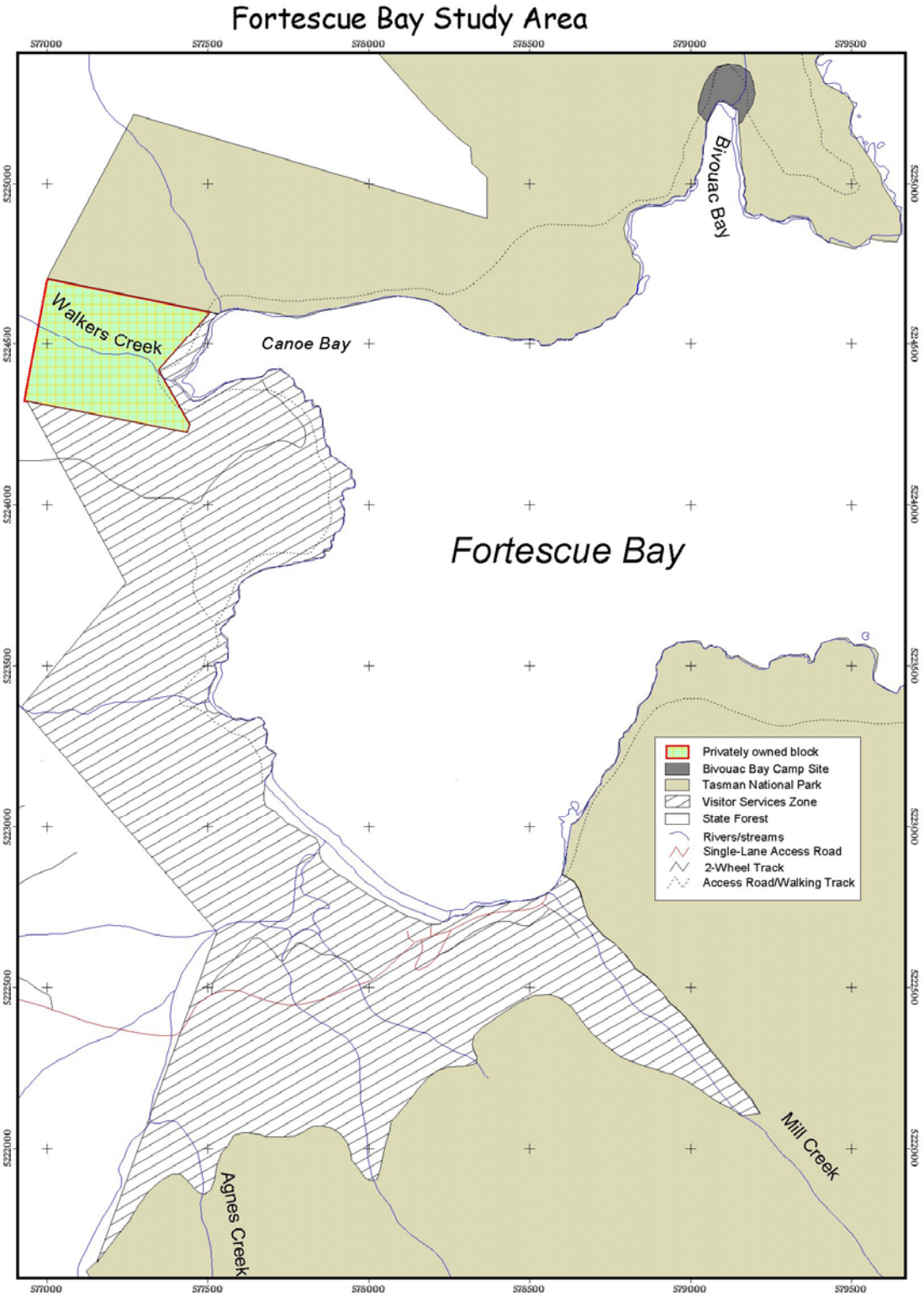
Introduction

This report provides an assessment of the nature conservation values of the area surrounding Fortescue Bay, Canoe Bay and Bivouac Bay in South Eastern Tasmania. For the sake of completeness the study also includes the area connecting Canoe Bay to Bivouac Bay which is currently included in the Tasman National Park Visitor Services Area.

The extent of the area concerned is illustrated by maps 1, 2, and 3. The report provides an integrated assessment of geomorphological, flora and fauna values, assessment of the condition and priority of these values and of the current condition of the area.

The private land block immediately adjacent to and to the West of Canoe Bay is subject to another assessment undertaken by Reserve Design and Management (RD&M) for the Department of Primary Industries, Water and Environment (DPIWE) and this report should be considered in conjunction with this current report (RD&M October 2000).

This report also makes assessment of the possible impact of visitor facilities in the area and proposes Land Management Zoning classifications for the areas concerned (as per the DPIWE Draft Land Management Zoning guidelines).



Map 1. Location of Fortescue Bay Study Area

Assessment and prioritisation of nature conservation values

The methodology for the assessment of nature conservation values adopted here is parallel to that adopted for the Foreshore Vegetation Mapping and Analysis component of the Tamar Estuary 2020 Strategy and the South East Coast Integrated Coastal Management Strategy - Vegetation and Fauna Components. This methodology was developed in cooperation with the Launceston, Georgetown, and West Tamar Councils, the project coordinators and steering committee of the Tamar Estuary 2020 strategy and the project co-ordinator of the South East Coast Integrated Coastal Management Strategy - Vegetation and Fauna Component and officers of DPIWE.

The methodology makes assessment of values compatible with regional, State, and National priority frameworks. Programs and priority frameworks considered include:

- The Tasmanian Regional Forest Agreement priority assessment process as overseen by the Comprehensive, Adequate and Representative Scientific Advisory Group (CARSAG).
- The Tasmanian Vegetation Management Strategy (VMS, TASVEG 2000).
- Where the level of resolution of the VMS vegetation categories is insufficiently detailed then subsidiary categories have been adopted that can be nested within the larger VMS categories. This process is compatible with the sub-regionalisation strategy under development by the Stratagic Design Sub-Group of CARSAG
- The methodology places recommendations and assessments in the framework of the Draft Guidelines for Land Management Zoning currently under consideration by DPIWE.

The methodology uses two separate descriptors which are the natural value characterisation and the condition survey.

Natural Values Characterisation

This characterisation will describe the areas considered in terms of a broad floristic classification as described above, faunal habitat and Geomorphological significance were also assessed. These assessments are based on site visits and surveys and consideration of contemporary data sets held by DPIWE (GTSPOT and TASVEG 2000). Staff of DPIWE, particularly Nature Conservation Branch were also consulted.

Significance was assessed against State and Federal legislation.

Condition survey

The second major descriptor used for the prioritisation of the nature conservation values in this report is an analysis of the condition vegetation, Geomorphological features and faunal habitat. Descriptions of levels of classification used for the condition analysis is reported in Appendix 1.

Methodology

Flora

A vegetation map of the area was compiled from 1:25,000 scale colour aerial photographs. Rectification of the aerial photographs to match 1:25,000 topographic map data for the area has allowed the production of a vegetation map which is accurate to approximately 10 metres.

A draft copy of the vegetation map was used to plan field survey work. The draft vegetation map was ground truthed during the field survey and amended where necessary.

Extra attention was paid to areas where there was doubt as to the composition of the vegetation, where boundaries were indistinct, and where it was apparent that there was specialized habitats (e.g. creek lines, dune communities, swamps etc).

All native plant species encountered were recorded. Where species could not be confidently identified in the field, specimens were collected and later identified.

The *Threatened Species Protection Act* 1995 lists plant species which are endangered, extinct, vulnerable, and rare and at risk. This list is updated as new information comes to light (L. Gilfedder pers com). The species recorded during this survey were assessed against this list to determine their conservation status.

The non-forest /coastal communities were assessed against relevant existing conservation status reports as is reported in the text, however these assessments are currently under review as part of the Vegetation component of the South East Coast Integrated Coastal Management Strategy. In general these communities have not been subject to condition analysis in the past and consequently many areas that have been classified as contributing to the security of these communities are, in fact, heavily weed invaded and subject to disturbance. This situation is exacerbated by the age of much of the existing data, some of which is now more than two decades old.

Plant communities recorded in this survey were described with reference to the Tasmanian Vegetation Management Strategy criteria and Kirkpatrick *et al*. (1995).

The Regional Forest Agreement process (RFA) has identified the current reservation status and priorities for the reservation of forest communities found in Tasmania. The forest communities recorded during this survey were assessed against these criteria. Non-forest communities were assessed for regional and state significance based on professional judgement and in consultation with officers of DPIWE.

In relation to specific species of significance, particularly species of *Euphrasia* reference was made to the Species Recovery Plan for members of this Genus (Potts 1999).

Geology, Geomorphology and Hydrology

The geological map of the area was compiled from 1:25,000 scale colour aerial photographs. Rectification of the aerial photographs to match 1:25,000 topographic map data for the area has allowed the production of a geological map which is accurate to approximately 10 metres.

A draft copy of the geological map was used to plan field survey work. The draft geological map was ground truthed during the field survey and amended where necessary. The geological and geomorpological units present within the study area are detailed in Map 3.

Faunal Habitat and Communities

Several habitat types were examined as part of this study. These include:

Coastal-Marine, which includes coastal heath and scrub and coastal *E. globulus* forest on Holocene sands, Including intertidal fauna communities and those occupying recent sand systems, shorebirds and seabirds.

Wet sclerophyll eucalypt forest including *E. obliqua* forest supporting wet forest fauna.

The final habitat type surveyed was Dry sclerophyll eucalypt forest, consisting of *E. obliqua* dry forest and *E. globulus* grassy forest.

Results of these surveys were compared to existing data compiled by DPIWE.

Results

Flora

Seventy seven native plant species were recorded from areas of native vegetation during this survey (Appendix 2). No attempt was made to identify introduced species in areas which have been sown to lawn.

The survey was conducted during early spring and thus many grass and herb species could only be identified to a genus level. Undoubtedly the area supports considerably more native species than have been recorded.

Of particular interest are two taxa of *Euphrasia* that occur in or adjacent to the study area. The both of these were recorded by Wendy Potts as part of the *Euphrasia* Species Recovery Plan (Potts 1999). These taxa were not recorded as part of the survey , probably due to timing.

Euphrasia sp. *Fabula* is an as yet undescribed species which occurs on exposed cliff faces on the Southern side of Bivouac Bay. This population includes some of the only 250 individuals of this taxa which had been located by 1999 (Potts 1999). Potts recommends an IUCN (1994) Red List classification of Endangered for this Taxa. As this species is restricted to inaccessible cliff faces then there is only limited possibilities that increased visitor numbers could have a substantial impact on the population.

The second Taxa of *Euphrasia* of concern is a meta population of a *Euphrasia semipicta* (Type 2) which occurs in exposed wet heath on the edge the walking track which leaves Fortescue bay adjacent to Mill Creek and goes to Cape Hauy. This taxa is proposed as a sub-species and is considered Vulnerable as per the IUCN (1994) Red List. This taxa has not been recorded with the study area but exists in areas immediately adjacent.

Plant communities

Seven VMS native plant communities were identified. Details of the structure and floristic compisition of each community is reported in Appendix 3.

As the VMS communities are very broad, more detailed community descriptions are provided by referring to Kirkpatrick *et al.* (1995). Map 2, illustrates the vegetation communities of Fortescue Bay and the surrounding area.

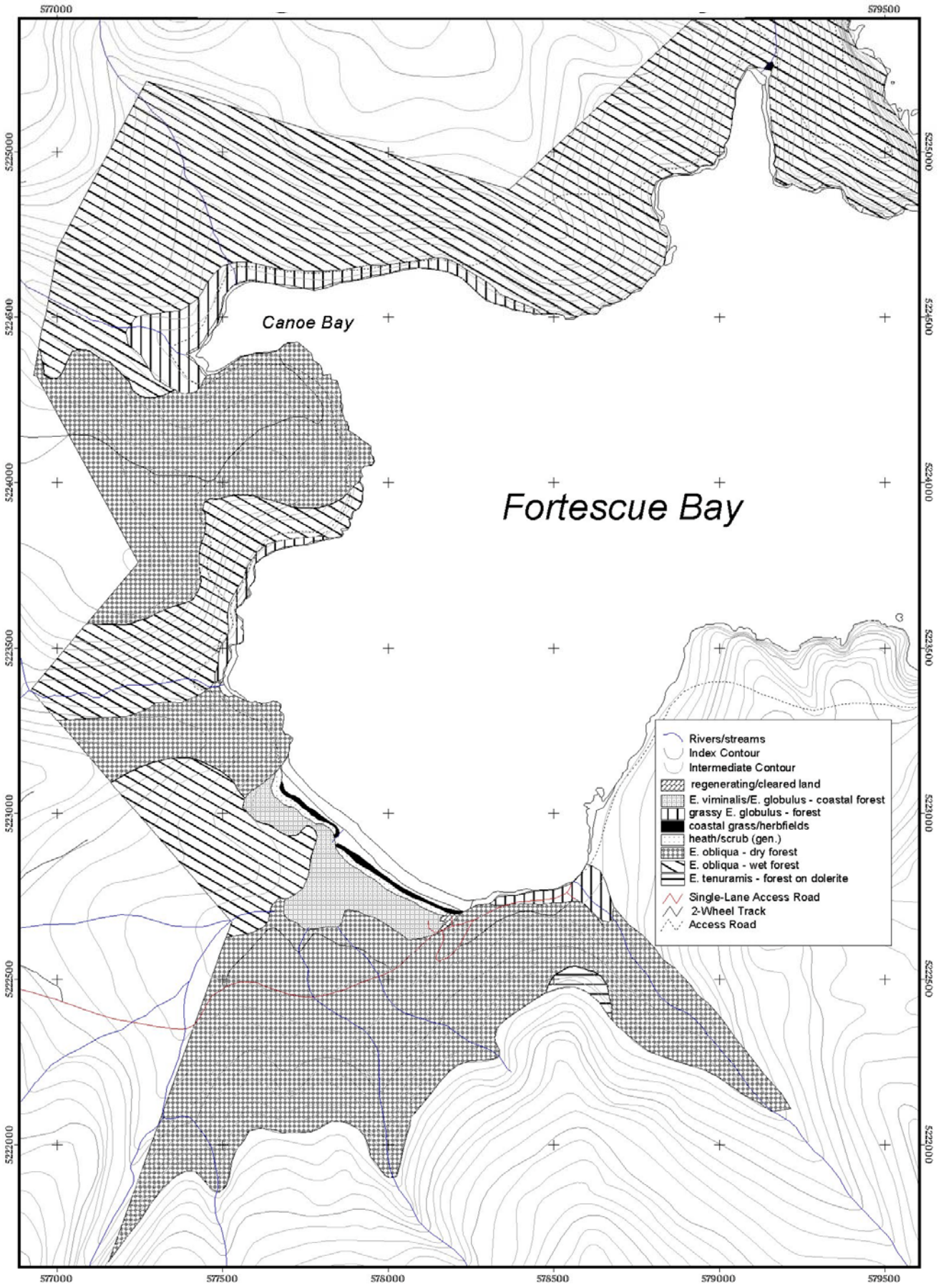
Eucalyptus viminalis/ Eucalyptus globulus coastal forest (Old Growth)

Conservation status: High priority for conservation under the RFA.

Condition: Condition 1 for all areas with the exception of areas immediately adjacent to the campground in the South East corner of the study area which have had the understorey modified to facilitate camping. In this area the condition is 3.

Vulnerability: Although generally robust disturbance can allow weed invasion. This problem may be exacerbated by nutrient enrichment.

Vegetation communities of Fortescue Bay



Map 2 Vegetation communities of Fortescue Bay

Grassy *E. globulus* forest (Old Growth)

Conservation status: High priority for conservation under the RFA.

Condition: Condition 1 for all areas except around picnic ground, car park and boat ramp which are 2.

Vulnerability: This community is generally robust but disturbance may allow weed invasion.

Eucalyptus obliqua - dry forest (Old Growth)

Conservation status: Old growth forest of this type has an intermediate level of significance for the RFA. A total of 2,100 hectares are required to achieve RFA targets within the South East Bioregion.

Condition: Condition 1 for all areas except around picnic ground, car park and boat ramp which are 2.

Vulnerability: Disturbance may allow weed invasion.

Eucalyptus obliqua - Wet forest (Old Growth)

Conservation status: Low priority for conservation under the RFA as reservation targets have been met in the South-East Bioregion.

Condition: Condition 1 for all areas.

Vulnerability: This community is generally robust but disturbance may allow weed invasion.

Eucalyptus tenuiramis - forest on dolerite (Old Growth)

Conservation status: Low priority for conservation under the RFA.

Condition: Condition 1 for all areas.

Vulnerability: Low vulnerability to disturbance although weed invasion may result from disturbance of ground surface and nutrient enrichment.

This forest is very similar to Dry *Eucalyptus obliqua* forest in both structure and floristic composition and is distinguished by the presence of *E. tenuiramis* as a co-dominant tree species.

Shrubby coastal heath/tall and wind pruned coastal scrub

Conservation status: Well reserved in Tasmania. However at most locations in South East Tasmania dune heath and scrub has been highly disturbed and replaced by Marram Grass, simplified communities dominated almost solely by *Acacia sophorae*, or pasture and other weed and garden species. Consequently the status of this community has upgraded to under some level of threat over the majority of its range within the bioregion.

Condition: The condition of this community within the area surveyed is currently 2.

Vulnerability: Highly vulnerable to trampling and fire with subsequent dune blowouts and invasion and replacement by Marram Grass.

Spinifex sericeus - Austrofestuca littoralis grassland (Kirkpatrick *et al.* 1995)

Conservation status: Well reserved in Tasmania. However at most locations in South East Tasmania dune heath and scrub has been highly disturbed and replaced by Marram Grass, simplified communities dominated almost solely by *Acacia sophorae*, or pasture and other weed and garden species. Due to the preliminary findings of the South East Coast Integrated Coastal Management Strategy surveys the conservation status of this community has been elevated to under some level of threat over the majority of its range within the bioregion.

Condition: Condition 2 for all areas due to the invasion of Marram Grass.

Vulnerability: Highly vulnerable to trampling and fire with subsequent dune blowouts and invasion and replacement by Marram Grass.

Spinifex sericeus-Leucopogon parviflorus grassland/shrubland (Kirkpatrick *et al* 1995)

Conservation status: Well reserved

Vulnerability: Substrates of dolerite bedrock and/or dolerite cobbles and boulders make this community relatively robust to trampling and fire.

Condition: Condition 1 for all areas.

Sedgeland/herbfield on alluvial sands at Bivouac Bay

The mouth of Bivouac Creek supports short sedgeland / herbfields composed of as yet unidentified sedge and herb species including *Plantago* sp. and *Cotula* sp. Further investigation is required during the flowering season. This community occurs on alluvial dolerite sand deposits at the mouth of the creek. There has been considerable erosion of the community and this erosion appears to be, at least in part, due to trampling. Increased pressure from trampling would pose a serious threat to the continued existence of the community.

Conservation Status: Unknown. Probably under some level of threat over the majority of its range within the bioregion. Requires further investigation.

Condition: Condition 2.

Vulnerability: This community is threatened by trampling.

Figure 1 *Eucalyptus obliqua* dry forest
Eucalyptus tenuramis forest on dolerite

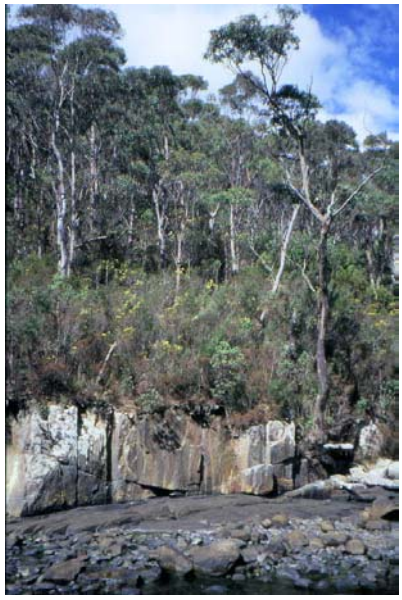


Figure 2 *Grassy Eucalyptus obliqua* Forest

Geology, Geomorphology, and Hydrology

Previous studies of the area have been undertaken by Russell (1983, 1998), North *et al* (1998), Todd (1998) and Davies (1988). For the purposes of this report these studies formed the basis for field survey and the following geological and geomorphological units defined. Structural sub-units are indicated on Map 3.

Jurassic Dolerite

Jurassic dolerite forms the bedrock throughout the study area. The dolerite is variably fine to medium grained with poor to moderately developed near vertical jointing and fracturing. Dolerite outcrops along ridgelines, crests and along the coast, but is mostly sub-cropping below skeletal soil profiles, beach and dune sands or colluvium. The dolerite is variably weathered, with thin rocky podsolic soil profiles developed on the crests and upper slopes. Deeper podsolic soil profile development is present on the mid and lower slopes and within the deposits of valley fill colluvium, where podsolic soil profiles are developed to depths of between 0.5 to 2 metres.

This Geomorphological unit displayed a Condition of 1 throughout the study area.

Quaternary Sediments

A bay-head barrier (beach and dune) system is located in Fortescue Bay (Figure 3).

The beach, which is 15 to 20 metres wide at low tide grades into a thin, variably 2-5 metre wide, low angle foredune which abuts the base of the 4-7 metre high primary dune. The foredune system is more dynamic than the vegetated primary dune being exposed to wave action during king tides and periods of high wave action. The beach and foredune sands are mostly silicic with minor shell grits and very minor organic content.

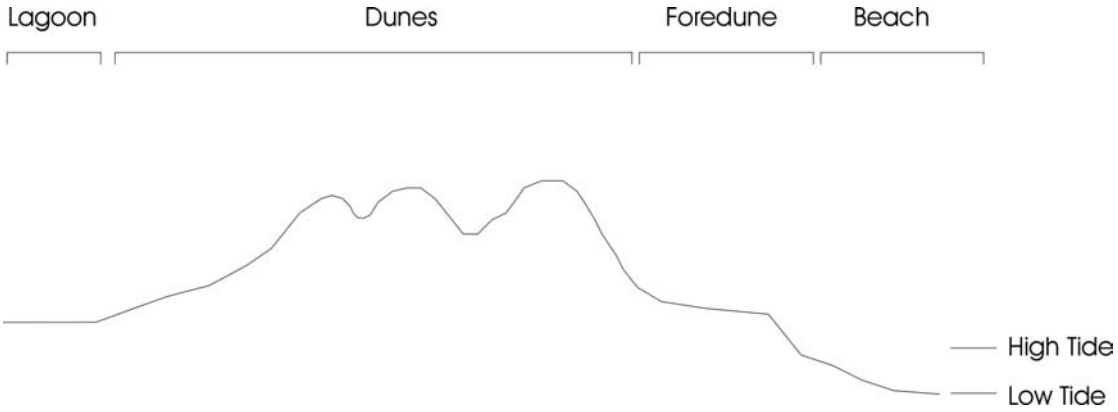


Figure 3 Outline of coastal system

The dunes and swales of the main dune system form a roughly 50-100 metre wide and 4 to 7 metre high system of dune ridges and swales and separate the sea from a lagoon system. This landform has probably developed in response to the post-glacial marine transgression which occurred during the early Holocene (Cullen 1998a).

The soils of the dune system are characterised by a 5 to 15 cm thick brown-black organic horizon which overlies variably grey to light brown fine well sorted, well rounded windblown sands.

Lagoonal sediments comprising gravels, sands, silts and mud occupy the area immediately behind the dune system in the middle of the beach. The sediments occupy a lagoon and low-lying marshland and swamp at the confluence of three creeks. The groundwater is within one metre of the ground surface throughout much of the swamp/lagoon area.

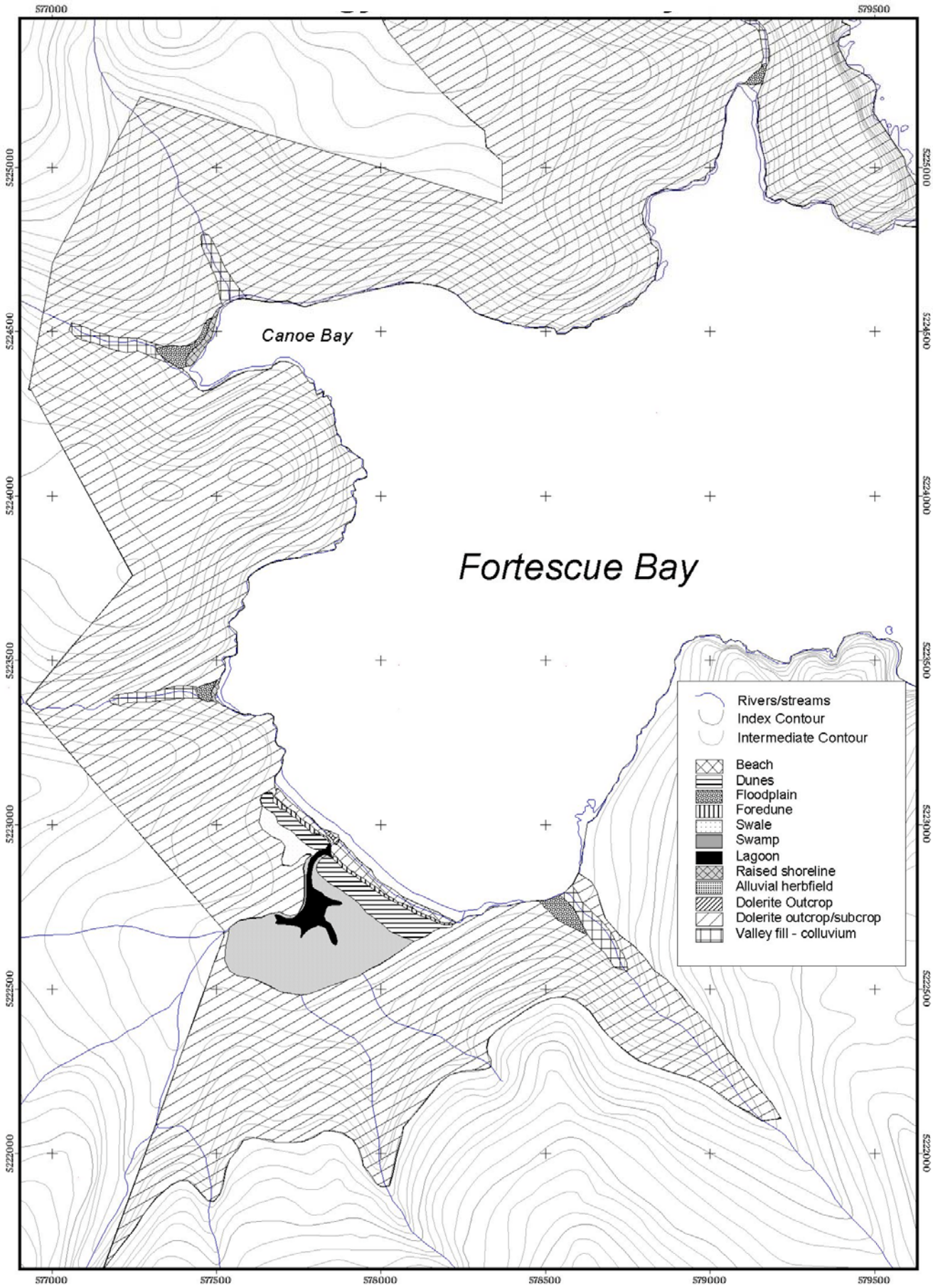
The soils of the lagoon and marsh are characterised by a 10 to 20 cm of dark brown to grey organic sands overlying variably saturated sands and sandy loams. Much of the soil profile is saturated or under water during wet periods.

Thick colluvial deposits cover the lower and footslopes of the dolerite hills and fill the valley floors. Creek cuttings exposed a variably rich clayey to sandy matrix supporting dolerite pebbles and boulders between 0.1 to 1 metre in diameter. Iron rich mottling is present throughout the profile.

A small consolidated alluvial fan deposit is present at the mouth of Bivouac Creek in Bivouac Bay. A 10 to 20 cm thick sandy soil profile is developed in the alluvium, which overlies a medium grained sandy-clay matrix supporting well rounded dolerite cobbles and boulders up to 30 cm (Figures 4 and 5). Well developed orange and orange-brown mottling is observed throughout the profile. The alluvium presently supports a coastal sedgeland/herbfield.

This geomorphic feature and vegetation community is particularly at risk from increased foot traffic and currently displays Condition of 2 throughout the study area.

Geology and geomorphology of Fortescue Bay



Map 3 Geology and geomorphology of Fortescue Bay


Figures 4 and 5 Coastal sedgeland/herbfield and soil profile.

Figure 6 Boulder beach at Canoe Bay

Well-sorted, raised dolerite boulder shorelines are present within Canoe Bay and between Fortescue Beach and Canoe Bay (Figure 6). Raised boulder berms rise up to 3 metres above present high tide levels. It is presumed that these beaches were formed either during a period of more extreme wave action, or at a relatively lower elevation through processes of tectonic uplift or a higher mean sea level.

This Geomorphological sub-unit displayed a Condition of 1 throughout the study area.

Hydrology

The flows into the lagoon streams are fresh (100 - 400 us/cm). The lagoon water is brackish and during high tides as the saltwater influx adds seawater (50,000 us/cm) raising levels up to 1,000-10,000 us/cm. During high rainfall events the lagoon opens to the sea and flushes the system of brackish water.

Substantial vegetation removal within the catchment will increase surface flow and increase sediment loads/suspended solids in watercourses and may cause siltation of the lagoon. Analysis of the suspended load during low water flow showed that the stream and lagoon waters carry less than 1 g/L. However a thick layer of brown silt covering pebbles in stream beds feeding the lagoon suggest substantial sediment load may be transported during higher stream flow.

The groundwater quality within Tasmanian dolerite generally exceeds World Health Organisation (WHO) levels for human consumption ranging from 1000-10000 us/cm.

The Quaternary Dunes were not sampled. It is however, likely that fresh groundwaters are present beneath the dune and lagoon systems. Extraction of these supplies may result in saltwater intrusion.

Fauna

Swift Parrot (*Lathamus discolor)*

The Swift Parrot is listed as endangered under the Tasmanian *Threatened Species Protection Act* 1995 and the Commonwealth *Endangered Species Protection Act* 1992. *E. globulus* grassy forest near the coast and *E. globulus* forest on recent sands in Tasmania is high quality foraging habitat for the Swift Parrot. Old-growth *E. obliqua* forest within a short distance of foraging habitat is high quality nesting habitat.

E. globulus forest on coastal sands and *E. globulus* grassy forest at Fortescue Bay provide high quality foraging habitat for the Swift Parrot. Swift Parrots use both forest communities at Fortescue Bay. Old growth *E. obliqua* wet forest and old-growth E. obliqua dry forest at Fortescue Bay provides ideal habitat for nesting. No nest sites have yet been identified in this area.

Mt. Mangana Stag Beetle (*Lissotes menalcas*)

The Mt. Mangana Stag Beetle is listed as vulnerable under the Tasmanian *Threatened Species Protection Act* 1995. This species is found in wet forest habitats in South East Tasmania. It is an obligate log-dwelling species.

Because of the destructive nature of surveying for the Mt. Mangana Stag Beetle an extensive survey was not undertaken. A couple of rotten logs in suitable habitat were surveyed without success. Nonetheless, *E. obliqua* wet forest at Fortescue Bay is likely to support this species.

Hooded Plover (Thinornis rubricollis)

The Hooded Plover is listed as vulnerable under the *Commonwealth Endangered Species Protection Act* 1992. Hooded Plovers are distributed throughout South East Australia and in Western Australia. In Tasmania they breed between August and March on sandy oceanic beaches, nesting above the high tide mark or in dunes.

During the survey a pair of Hooded Plovers were observed to occupy an area on the northern half of Fortescue Bay beach.

Burgundy Snail (*Helicarion rubicundus*)

The Burgundy Snail is listed as rare under the *Tasmanian Threatened Species Protection Act* 1995. This species is only known from wet eucalypt forests on the Forestier and Tasman Peninsulas.

The Burgundy Snail was not encountered during the present survey however *E. obliqua* wet forest within the Fortescue Bay Visitor Services Zone is highly likely to support this species.

Other significant fauna species

White-bellied Sea- Eagle (*Haliaeetus leucogaster*)

The White-bellied Sea-eagle has been nominated for listing under the *Tasmanian Threatened Species Protection Act* 1995. It is threatened by coastal subdivision and subsequent development and loss of nesting habitat.

Fortescue Bay is a highly productive locality for this species. One nest is currently known and recorded from the study area and an additional nest was identified during the present survey. Further nests may be found in the future. During the present survey two sea-eagles were flushed from shoreline trees North of Fortescue Beach. Fortescue Bay is relatively undisturbed, is remote and is buffered by extensive tracts of native forest. It provides an abundant source of marine prey and an extensive source of old-growth tree species close to the coast for nesting. Two or three sea-eagle territories may be present at Fortescue Bay. Currently two nest sites are known from Cape Hauy, one at Bivouac Bay and a possible new nest on the major gully between Canoe Bay and Fortescue Beach.

Sea-eagles are sensitive to disturbance during the breeding season. Desertion of nest sites and failed breeding are potential outcomes from disturbance. Prescriptions for the protection of nest sites and nesting birds are identical to those formulated for Wedge-tailed Eagles. It is essential that park visitors do not disturb birds during critical breeding periods. Locations of nests are recorded on the GTSPOT Data base of the GIS section of DPIWE with the exception of the most recently identified site which is located at the head of

Little Penguin (*Eudytula minor novaehollandiae*)

The Little Penguin is not listed under the *Tasmanian Threatened Species Protection Act* 1995 but is considered of high conservation significance because colonies are under threat. Non-island colonies are in decline on the Tasmanian mainland.

A Little Penguin breeding rookery is located on the northern end of Fortescue Beach and in suitable habitat for burrowing in wet *E. obliqua* forest north of the beach.

Little Penguins are currently breeding and nests were noted at the base of trees in the major gully between Canoe Bay and Fortescue Beach. Dead Little Penguins were also noted on small tracks leading from the coast into wet *E. obliqua* forest.

Pied Oystercatcher (*Haematopus ostralegus*)

Pied Oystercatchers are fairly common around the seaboard of Australia. They are most successful at breeding on beaches where there is little disturbance by human activity, domestic dogs and vehicular activity etc.

During the present survey a pair of Pied Oystercatchers were nesting at the far northern extremity of Fortescue Beach. Movement past the pair on the narrow beach disturbed the birds from the business of nesting.

Spotted Tailed Quoll / Tiger Quoll (*Dasyurus maculatus*)

The Tiger Quoll is a priority species under the RFA. It has been observed in the study area which contains significant areas of suitable habitat.

Masked Owl (*Tyto novaehollandae*)

The Masked Owl is present in the study area, and is a species of concern under the RFA. It is currently being proposed for listing under the Federal Threatened Species Legislation. The Study area provides suitable habitat for this species.

Beach fauna communities

The sandy beach at Fortescue Bay provides habitat for a number of invertebrate organisms which are of significance. These include the undescribed land hopper, *Austrotroides* sp., which has been collected only from this beach and Canoe Bay (Richardson *et al* 1997). This species has very limited distribution occurring only to within 100 meters of the beach.

It is also the habitat of a currently undescribed sandhopper which is listed as rare and susceptible in Tasmania (IAC 1994). Fortescue Bay is also the type location for the palustrid talitrid amphipod, *Eorchestia rupestris* (Richardson 1993). Richardson *et al* (1997) also reported that the stand line of Fortescue Bay has the highest diversity of invertebrate fauna of any sandy beach in Tasmania.

National Estate Values

Fortescue Bay is subject to a listing as an indicative place for inclusion on the register of the National Estate. The area concerned is restricted to the area of coastline between Dolomieu Point to the North and Cape Hauy to the South East. The significance of Fortescue Bay in relation to the criteria of the national Estate is summarised as follows. Much of this information is dealt with elsewhere in this report under the appropriate subheadings, it is provided here for consistency. The following is an extract from the listing statement for the area and provides a good summary of the values of the area discussed elsewhere in the report.

Fortescue Bay has the highest diversity of strandline fauna of any beach in Tasmania. A rare endemic sandhopper species which is listed is found here and it is the only known locality of the undescribed landhopper, *Austrotroides* sp.

The undisturbed vegetation which backs the sandy beach is unusually diverse. Beaches, which are not infested with exotic Marram grass are unusual on Tasmania's east Coast.

The beach is a breeding site for the threatened hooded plover. The area is widely used as a research and teaching site by the University of Tasmania. It is type locality for a species of crustacean.

The area generally has features of outstanding scenic and Geomorphological value.

Summary and results

The area subject to this study consists of a sequence of biological/geomorphological features typical of high rainfall areas in Southern Tasmania. The area contains significant values which will be considered as a consequence of the State's requirement to act within the constraints of the Tasmanian State Coastal Policy 1996 and the State Policy on Water Quality Management 1997. Although no specific further reference is made to these documents, each of the recommendations presented below has been considered against the objectives and principles of these two policies and also the general principles of good management of areas of high nature conservation significance.

Current usage and impacts

The study area is subject to a number of uses which vary according to location.

General area

The entire area including the existing walking track system are used by both campers and day visitors for passive recreation in the form of walking. This activity has limited impact except in the area of Fortescue beach where attention should be focused on minimising impacts to fauna and the beach vegetation and physical environment.

Boating is popular in the area and with the exception of the usual impacts associated with motorised vessels has little impact. Currently however numbers of boat users are low and this situation should be subject to monitoring as increased boat numbers could affect both environmental quality and noise pollution levels with associated impacts on fauna.

Fortescue Beach

This area is treated in other parts of this report. Currently usage is mostly passive and confined to general beach use and walking. These impacts are focussed by the nearness of the camping area and to car parks. The implications of these activities are discussed elsewhere.

Fortescue Beach Camping Ground.

The area currently set aside for camping contains the only significantly degraded part of the study area. Currently impacts are minimal and the situation has improved greatly in the last decade since active management of the has commenced. The impacts of the current camping area are restricted to the potential spread of weeds both carried passively to the area deliberately planted to provide a surface to camp on. Recommendations in relation to the camping ground are dealt with elsewhere.

Canoe Bay

Canoe bay is currently used for passive recreation and has been subject to a previous report by RD&M (RD&M2000).

Bivouac Bay

The standing Camp at Bivouac bay has the potential to cause serious degradation of the local area due to nutrient enrichment, weed invasion, increase in fire risk, soil compaction and erosion, and the incidental degradation associated with large numbers of campers. Camping within the study area should in future be restricted to the Fortescue Bay site.

Weeds and related threats to the near coastal zone in South Eastern Tasmania

Significant threats exist to coastal communities in the region that will place further pressure on these communities in the intermediate future. Weed invasion is a primary concern. Initial results from the South East Coast Integrated Coastal Management Strategy Vegetation and Habitat survey (in progress) indicate that Marram Grass (*Ammophila arenaria*) is a more significant threat to these communities than it was in the recent past. Certainly it appears that Marram Grass is spreading in the South East and the level of infestation has increased at Fortescue Bay in the last decade (Personal observations P.Cullen, Greg Blake).

Other threats include the Sea Spurge (*Euphorbia paralias*) which is rapidly extending its range down the East Coast of Tasmania. Infestations have been reliably reported from Marion Bay Beach within 30 Km. of the study area. Sea Spurge is capable of totally replacing native sand binding vegetation once established.

Considering these threats and the preliminary findings of the South East Coast Integrated Coastal Management Strategy surveys it is suggested that the conservation significance of these near coastal communities in the region be upgraded at least until the findings of the latter study are finalised. A new category of conservation significance is suggested for use which reflects the significance of these communities and the uniformity of threats over the extent of their range. This is a consequence of the ubiquitous nature of these threats in the region and the current paucity of in knowledge in this regard. This category is “under some level of threat over the majority of its range within the bioregion”.

Forest values

The area contains several forest communities. The value of these forest communities is high regionally and at a State level. They constitute some of the relatively small remaining area of forest in the South East of Tasmania that is not managed for timber production. The maintenance of an area of forest which has in the past been subjected to only sporadic selective logging is important in the region.

The existence of old growth characteristics, over much of the area studied classify these forests as Old Growth under the system of classification evolved by CARSAG for the implementation of the RFA.

Aside from this more general consideration, several of the forest communities have significant conservation value under the criteria of the RFA. These values are detailed in the community descriptions provided previously.

The communities which display the least significance in terms of conservation are the *E. obliqua* dominated dry and wet forests. Although these forests do not in themselves possess high conservation significance, these forest communities provides habitat for fauna of high conservation value. These values are detailed in the fauna section of this report.

A further consideration is that the narrow strip constituted by the study area provides both a visual and physical barrier to the areas of commercial timber extraction which exists in the hinterland.

Coastal geomorphology values

The existence of an almost unaltered barrier (beach and dune) system on Crown land, managed for nature conservation is highly significant in the light of the general degradation of coastal areas in south-eastern Tasmania. In fact the bay head barrier at Fortescue Bay is the most intact barrier system on the Tasman Peninsular.

The near coastal zone and dunes are highly erodable, impacts include vehicle and foot traffic. Near coast sand-loam transition is moderately erodable. It is presently under grass at Western end of Fortescue beach.

Dune/lagoon equilibrium could be compromised by both increased surface water flow or sediment loads resulting from clearance in the upper catchment and/or destabilisation of the dune system. Colluvial/alluvial fans have moderate to high erodability when cleared of protecting vegetation particularly during rainfall events.

Although a slow process of degradation, related to the invasion of weed species discussed previously and foot traffic on the beach and fore dunes, is underway, this is not yet so entrenched that it cannot be easily reversed. As yet the process of Marram grass invasion has not impacted significantly on the morphology of the dunes. A relatively limited effort in relation to the removal of Marram grass and some vigilance in relation to the potential establishment of Sea spurge could return these areas to a highly natural state (Condition 1 as per this report).

In this regard there are few, if any, beach systems in south-eastern Tasmania in similar condition, particularly not systems which are actively managed for nature conservation. Unfortunately it is these areas that are most vulnerable to potential impact from increased visitor numbers and in this situation lies the dilemma of the location of visitor facilities in the area. The beach at Fortescue Bay is the only sandy beach in the area and already, with the existing, relatively low level of usage, shows signs of requiring active management to prevent degradation of geomorphological and vegetation values.

However, with the current level of usage and a minimal increase in the effort to maintain these values the situation can easily be maintained or improved.

The difficulty in this regard is that although it would be impractical and inadvisable to directly impact on the near coastal fringe by providing visitor facilities in that zone, it is extremely likely that a development of any kind within the study area would have

significant deleterious effects on the ecological and geomorphological values of the beach. This would merely be a function of increased visitor numbers.

The beach is clearly the focus of visitor interest in the area and has been for an extended period of time. Currently very limited attempts are made at regulating visitor movements and little or no interpretation exists to inform visitors of the values and potential threats to the integrity of the beach system. This situation would certainly need to change if visitor numbers were increased as a consequence of a development in the area.

General geomorphological considerations

Dolerite country constituted the majority of the non-coastal part of the study area and has moderate to low erodability where vegetated. However where cleared it displays high soil erodability on moderate to steep slopes. Russell (1998) identifies that landslips have occurred on slopes greater than 14^{o} on the Tasman Peninsula on dolerite substrate where soils are thick and sub-surface soils are saturated. No evidence of past or current landslips were observed during the study, and for the most sub-soils appeared relatively dry. However during and after prolonged rainfall events or wet seasons the soils may become less stable resulting in soil creep or landslips if cleared of stabilising vegetation.

The geomorphological features of the study area, with the exception of the coastal systems composing the beaches, dunes and floodplains, and the areas composed of colluvium valley fill, are generally stable.

Currently only minor problems exist in the area in relation to accelerated soil erosion. These problems can be seen around car parks and in areas where earth works have been undertaken. This situation should be seriously considered before any major development is contemplated. The consequences of failing to do so are twofold, firstly there is the obvious degradation of the terrestrial environment that results from soil loss and erosion. Secondly the suspension of soil particles and erosion products in run off and would negatively impact the water quality of Fortescue Bay.

Hydrological considerations

With the exception of commercial logging operations, the catchments of the creeks and water courses that traverse the study area have high integrity. Consequently water quality is good and as reported previously, the current impact on the lagoon system at Fortescue Bay and on the bay in general is very limited. Once again this is an unusual situation in the South East of Tasmanian where areas of native vegetation are generally small and intermixed with land that is managed for a variety of purposes.

The absence of farming activities with their potential high output of nutrients and suspended solids and potential for inputs of agricultural chemicals, makes the catchments of the water courses that enter Fortescue Bay of high significance.

The importance of maintaining water quality in the catchment of these streams is further magnified by the presence of the lagoon / beach dune system in the middle of Fortescue Bay. This system is in very good condition and is among the only representations of this type of water body in the South East of Tasmania. As this

system is frequently closed at times of low fresh water input it is highly susceptible to nutrient enrichment and siltation. The flushing action of the ocean further complicates the situation in relation to the lagoon as concentrations of nutrient and silt would periodically be dumped into Fortescue Bay if the lagoon were to become eutrophied and subject to siltation.

Faunal values

Any human traffic along the Fortescue Beach and onto the track leading north from the beach may disturb breeding shorebirds. This may have a negative impact on breeding success and survival of shore and seabirds as well as on the condition of the coastal dune vegetation.

Minimisation of the impact by visitors on threatened and significant fauna species and communities at Fortescue Bay could be partly dealt with by appropriate interpretation. Visitors to Tasman National Park expect to be able to use Fortescue Bay beach and walk through the coastal zone. This is fundamental to the appreciation the aesthetic and natural values of the area. To maintain these values they must do so with an appreciation of the fauna values and their sensitivity to disturbance, and the sensitivity of the fauna habitat to degradation.

:The following actions will significantly reduce impacts on species of significance:

Mt. Mangana Stag Beetle (*Lissotes menalcas*)

Damage or removal of dead and old growth trees and the rotting log component of Mt. Mangana Stag Beetle habitat should be minimised as this reduces available habitat for this species. Placement of visitor facilities in *E. obliqua* wet forest should not be contemplated and disturbance of forest ground habitat due to the construction of walking tracks should be minimised. Regeneration of streamside habitat adjacent to Mill Creek, which has been partially cleared, is affected by human activities and should be encouraged to further extend habitat.. Some small areas of weeds require eradication i.e. *Rubus fruticosus*, *Vinca major* and *Zantedeschia aethiopica*.

Hooded Plover (*Thinornis rubricollis*)

Increased visitor numbers have the potential to disturb nesting pairs of Hooded Plovers and their offspring. Ever attempt should be made to minimise impacts by appropriate interpretation and rationalisation of beach access.

Marram grass (*Ammophila arenaria*) is considered to have a negative impact on the suitability of dunes for nesting by Hooded Plovers (Cullen 1998b). Infestation of the beach and dunes by Marram grass at Fortescue Bay is minor and has the potential to be controlled. This provides another reason to remove Marram grass and rehabilitate the dune system. Attempts should be made monitor for reinfestation and regeneration of Marram grass. Carefull attentions should be payed to monitoring for Sea Spurge (*Euphorbia paralias*) as this species would almost certainly reduce available habitat should it become established.

Burgundy Snail (Helicarion rubicundus)

Every attempt should be made to minimise destruction of the ground habitat in *E. obliqua* wet forest including construction of walking tracks.

White-bellied Sea- Eagle (*Haliaeetus leucogaster*)

The exact localities of sea-eagle nests should not be identified to park visitors though areas of breeding habitat should be identified and avoided during the breeding period. It is recommended that human activities be restricted at least 500 metres away, or 1 km if in line of sight of the nest, from the nest site during the breeding season (August to January). Locations of previously mapped nests are available with reference to the GTSPOT data base and the new nest location, discovered during this study will be added in the near future. No expansion of visitor usage should occur without reference to the data base.

Little Penguin (*Eudytula minor novaehollandiae*)

Little Penguins are vulnerable to disturbance during the moult period early in the year and during breeding. The period concerned extends from October to March. . The use of lights and torches at night during the breeding season may deter Little Penguins from coming ashore. Nest sites in soft substrates such as sand dunes may be vulnerable to destruction by human activities in the immediate area.

Visitors should avoid visits to nest burrows during the breeding season and the use of lights at night where adult birds are coming ashore after foraging should be avoided.

Beach Invertebrate Fauna Communities

As described previously the invertebrate fauna of the beach is of special significance due to its diversity and the presence off several significant species. These communities are subject to disturbance by trampling and habitat destruction. The current diversity and abundance of invertebrate fauna on the beach may be a consequence of the low level of disturbance due to low visitor numbers and the relatively intact nature of the entire beach system.

Swift Parrot (*Lathamus discolor*)

Foraging by Swift Parrots is unlikely to be affected by the use of Fortescue Bay by visitors. However due to the potential of depletion of populations of Swift Parrots and other native bird species by collisions with windows any infrastructure to be located in the area must comply with the recommendations of the DPWIE publication "Prevent window collisions and save our native birds" (PWS 2000)

Other issues arise from destruction or damage to *E. globulus* trees to provide for visitor facilities. Any *E. globulus* tree of a diameter exceeding 40 cm within the Visitor Services Zone is considered to be important for foraging by the Swift Parrot. Any development should avoid destruction of *E. globulus* trees. Any rehabilitation or revegetation works in *E. globulus* mapped forest on coastal sands behind the beach and along the rocky coastline should consider *E. globulus* as a priority for planting.

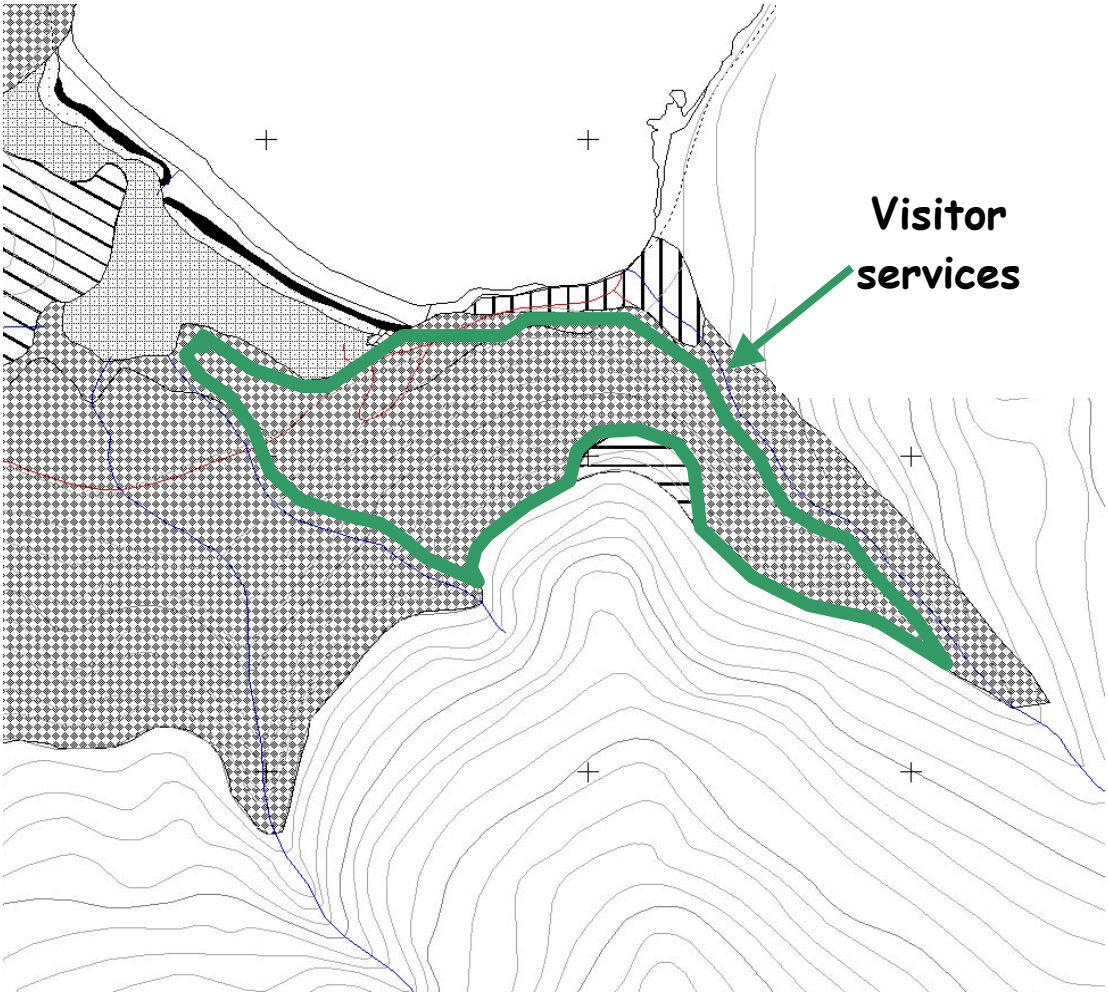
Indeed, a number of trees destroyed for the development of existing visitor facilities near the boat-launching ramp would have been *E. globulus*.

The occurrence of Swift Parrots at Fortescue Bay is the subject of ongoing monitoring by the Threatened Species Unit of the DPIWE, every attempt should be made to avoid compromising these monitoring sites and attention paid to the results of monitoring which may indicate impacts of proposed developments.

Recommendations

Due to the significant nature conservation values of the area, its integrity and condition the majority of the study area should be rezoned to the protection 1 category as per the Draft Land Management Zoning Guidelines. This is due to the high significance of the area and the need to manage it sympathetically to maintain its current values. These values include the significance of the forested areas including those that have high significance under the criteria and rules of the RFA. The maintenance of faunal habitat in areas which provide habitat for species of significance and the maintenance of the integrity of the forested lands within the study area which are important in maintaining the character and ecological values of the region in general and the surrounding lands managed for timber production.

The exception to this zoning should be an area defined by the green outline, Visitor Services, on Map 4, as per the Draft Land Management Zoning Guidelines. This area is defined by the extent of the dry *E. obliqua* forest South of the lagoon on Fortescue Bay and South East of the Southern most of the three creeks which flow into the lagoon.



Map 4 The green outline shows the Visitor Services Zone.

This zoning is defined by the relatively low conservation significance of the forest community, the existence within this area of the existing visitor facilities which include cleared land and areas sown to introduced grass species and the relatively robust nature of the geomorphology in this area. Any further infrastructure to be constructed with the study area, with the exception of suitably constructed walking tracks should be restricted to this area.

If developments within the study area are to be considered then increases in visitor numbers should be dealt with very carefully. Considering the current impacts any increase in visitor numbers would have to be accompanied by a detailed monitoring regime and plans to eliminate detrimental effects.

The standing camp at Bivouac Bay should be closed and regenerated and all camping activities within the study area restricted to the area indicated on map 4.

Current camping activities seem to have a minimal impact and with due attention to maintaining environmental quality should be allowed to continue. Numbers of campers should be restricted to current levels.

Within this zone the following restrictions should apply to the establishment of further visitor services particularly to the establishment of permanent structures and earthworks.

- Attention should be payed to the *Euphrasia* taxa discussed previously in this report if developments are planned. The recommendations of the Recovery Plan for Threatened Tasmanian Lowland *Euphrasia* Species 1997-2000 (Potts 1999) should be implemented particularly in relation to population verification and identification.
- Attention must be payed to the reduction of the potential for bird strike in the design of infrastructure as per the recommendations made previously in this report.
- No further development should occur within 50 metres of the high water mark on Fortescue Bay beach.
- No development should occur within 30 metres of the temporary water course which flows into the lagoon.
- No water originating from the visitor services facilities should flow into Fortescue Bay or the lagoon. This is particularly important in the construction phase of any future development. Utmost attention must be paid particularly to the prevention of siltation and nutrient enrichment of the lagoon.
- Similarly no development should occur within 30 metres of Mill Creek to the south of Fortescue Bay and similar restrictions should apply as per the previous point.
- Any removal of vegetation within the visitors services area should be minimised, particularly the removal of mature trees and provision should be made to ensure the maintenance of the canopy cover of the area. This should include provision for the regeneration of mature trees by the retention of all age classes, special attention should be payed to trees that show old growth characteristics and where feasible these should be retained.

- Aside from the restrictions imposed by the Forest Practices Code forestry operations in the catchment of streams that enter the greater Fortescue Bay should make every attempt to reduce levels of suspended matter, chemicals used in the promotion of growth and protection of plantation species.
- No development should occur on the area of colluvium in the valley caused by Mill Creek.
- Particular attention should be paid to the protection of the area of *E. globulus* coastal forest to the north of the visitor services area and to the area of *E. globulus* grassy forest to the east of the visitor services area and surrounding the mouth of Mill Creek.
- Sewerage and waste water should be managed on a minimum impact basis with discharges of waste water reduced to an absolute minimum and not discharged into the lagoon or the swamp area which surrounds it and zero emission of sewage effluent. To achieve the latter composting toilets or tanks that can be emptied in a suitable disposal area should be used.
- Access to the beach should be consolidated and hardened. One access at the southern end of the beach adjacent to the existing boat ramp should be formalised as the only appropriate access to the beach.
- Appropriate interpretation should be put in place to alert visitors to the fragility of the beach and dune system and concerns related to the fauna which inhabit the beach, every attempt should be made to restrict use of the beach to the area between the sea and the foredune and special emphasis should be placed on making visitors aware of the fragile nature and significance of vegetation on the foredunes.
- Attempts to remove Marram grass from the beach should be stepped up with the intention to have removed it completely within 5 years (before 2005). A watching brief should be maintained on the establishment of other weed species particularly sea spurge. No introduced species should be used in rehabilitation and wherever feasible local native species should be used for regeneration and site remediation.
- The existing use of areas outside of the visitor services area but inside the study area may be maintained but further track building and the development of other sites outside of the visitor services should be curtailed.
- A survey of the current and potential impact of soil pathogens on the study area should be undertaken before any further developments occur in the area. This study should consider the impacts of the spread of soil pathogens from the visitor services area into adjoining areas both within the Tasman National Park and the adjoining Crown land areas managed for timber production. If such a study should indicate a risk of a worsening of the situation in relation to the distribution of soil pathogens then an active campaign should be undertaken to limit the impact of soil pathogens on surrounding areas.
- Appropriate interpretation should be provided to inform boat owners using the boat ramp and the bay of the potential risk posed by the introduction of introduced marine organisms into the Bay from areas already infested.

References

Bell, P. J. & Mooney, N., 1999; *Wedge-tailed Eagle Recovery Plan 1998-2003*. Department of Primary Industries, Water and Environment, Hobart.

Brereton, R. *Management Prescriptions for the Swift Parrot in Production Forests*. Report to the Tasmanian Regional Forest Agreement Environment and Heritage Technical Committee.

Bryant, S. L. & Jackson, J., 1999; *Tasmania's Threatened Fauna Handbook: what, where and how to protect Tasmania's threatened animals*. Threatened Species Unit, Parks and Wildlife Service, Hobart.

Cullen, P.J., 1998a; Coastal Dune Systems of South-Western Tasmania: Their morphology, genesis, and conservation. *Nature Conservation Report* ***No 98/1,*** Parks and Wildlife Service, Tasmania.

Cullen, P.J., 1998b; *Ammophila arenaria* and *Euphorbia paralias*: Serious threats to the integrity of the South West Tasmanian Coastline, parks and Wildlife Serve Tasmania, Unpublished report.

Davies J., 1988; *Landsystems of Tasmania, Region 6 - South, East and Midlands, A resource Classification Survey*. Department of Primary Industry and Fisheries Tasmania.

Kirkpatrick, J.B., Barker, P., Brown, M.J., Harris, S. and Mackie,R., 1995; The reservation status of Tasmanian vascular plant communities. *Wildlife Scientific Report* **95/4**. Parks and Wildlife Service, Tasmania.

Lane, B. A., 1987; Shorebirds in Australia. Nelson Publishers. Thomas Nelson Australia, Victoria.

Meggs, J. M. & Taylor, R. J., 1999; Distribution and Conservation Status of the Mt Mangana Stag Beetle, *Lissotes melacas* (Coleoptera: Lucanidae) *Papers and Proceedings of the Royal Society of Tasmania* 133: 23-28.

North, A., Johnson K., Ziegler, K., Hopkins, K., Ziegerler D., and Watts S., 1998; *Flora of recommended areas for protection and forest reserve in Tasmania. Reserve reports: volume 4*. Forest Practices Board, Forestry Tasmania and Parks and Wildlife Service, Tasmania.

Peters, D. and Thackway, R., 1998; *Reservation status of forest communities and old growth using revised bio regionalisation and fuzzy boundaries*, Working Paper to CARSAG.

Russell J.A., 1998; *Tasman Peninsula Landscape Development Manual: Eaglehawk Neck to Port Arthur*. Centre for Environmental Studies, University of Tasmania.

Russell J.A., 1983; *Tasman Peninsula Resources: Hazards to Development arising from Soil Conditions in Residential zones, research reports* No 3, Project No 32. Centre for Environmental Studies, University of Tasmania.

Taylor, R. J., 1991; Distribution and habitat of *Helicarion rubicundus* (Pulmonata: Helicarionidae), a rare land snail. *Papers and Proceedings of the Royal Society of Tasmania* 125: 27-28.

Todd, D., 1998; *Fortescue Bay - Landsystem Analysis and Impact predictions*, Unpublished Report, Centre for Environmental Studies, University of Tasmania.

Pers Comm's

Louise Gilfedder; 2000- Senior Botanist - Department of Primary Industries, Water and Environment, Tasmania.

Appendix 1

Floral community condition survey

The following four levels of classification were used for condition analysis. These condition criteria are compatible with the Foreshore Vegetation Mapping and Analysis component of the Tamar Estuary 2020 Strategy and the South East Coast Integrated Coastal Management Strategy.

Categories of condition:

1. Areas that are highly natural in their character and have little evidence of weed invasion, erosion or other forms of disturbance. Areas that provide important habitat or which have significant geomorphological features may also be included is this category. This classification represents a limited need for intervention other than protection from overt disturbance and some degree of mediation of intervening processes such as nutrient enrichment, unsuitable fire regimes, grazing, and dumping of garden waste and other sources of biological pollution.
2. Areas which are either largely natural or actively regenerating which have significant non native components but which retain significant value in terms of habitat, retention of native species in a local area or other contributions to the maintenance of local biodiversity. This category implies a need for active intervention to prevent further degradation and may require active regeneration.
3. Third category consists of areas of land which have some native species but which are extensively modified and which although they may retain significant recreational values are sufficiently degraded to warrant little value for nature conservation. Where they will contribute significantly to biodiversity these areas may be strategically regenerated. This latter process may require a high level of intervention and a significant expenditure of resources.
4. The final category consists of areas which have been degraded in terms of nature conservation to the point where they contribute little or nothing to the maintenance of biodiversity but like the other categories need to be actively maintained to ensure they continue to contribute to other environmental parameters such as water quality and pollution prevention. These areas should be regenerated only if they are of extreme strategic value and if specific and targeted funds are available.

Geomorphology condition survey

1. Areas that are highly natural in their character and where there has been little or no disturbance to landforms, accelerated erosion, invasion by weeds (particularly species which grossly affect geomorphic processes) and where there is little threat from processes on adjacent or other areas which would

affect the integrity of the identified area. Such processes could include changes to sediment dynamics, changes to hydrology, etc. These areas will contain an archive of information relating to natural processes and landscape history and will provide examples of ongoing landscape processes. They are therefore of high heritage value. Areas that contain features of significant geomorphological or geological heritage would be included in this category. Areas contain geomorphic features that provide natural habitat for significant species will be included in this category (e.g. beach and dune systems in natural condition). This classification represents a limited need for intervention other than protection from overt disturbance and some degree of mediation of intervening processes such as nutrient enrichment, unsuitable fire regimes, grazing, and dumping of refuse and garden waste and other sources of pollution. Consideration should also be given to threatening processes which occur on adjacent or other areas which will directly affect geomorphic processes on the area identified.

2. Areas which are either largely natural or where natural processes have been re-instated and there is an expectation that natural processes will dominate further landform development. Areas which contain significant portions of non-native landforms, embedded in which are features of geomorphic significance or geomorphic features which provide habitat for significant species. Such features will contain archives of information regarding past landform processes. Where possible they should be managed to provided examples of ongoing processes. This category implies a need for active intervention to prevent further degradation and may require active rehabilitation to restore natural processes (this might include erosion control, weed control etc).

3. The third category consists of areas of land that posses elements of natural landforms (e.g. beaches that are backed by dune systems which have largely been cleared of native vegetation and replanted with exotic species). These areas will retain an archive of natural processes but ongoing landform processes are likely to be dominated or at least modified by unnatural factors. Although they may retain significant recreational values they are sufficiently degraded to warrant little value for nature conservation. These areas may be strategically regenerated where they will contribute significantly to nature conservation. This latter process may require a high level of intervention and a significant expenditure of resources.

4. The final category consists of areas in which landforms have been degraded to such an extent that they contribute little or nothing to the maintenance of geo-diversity or habitat. These areas may need active maintenance to ensure they continue to contribute to other environmental parameters such as water quality, erosion control and pollution prevention. These areas should also not pose a threat to other more significant areas and should be rehabilitated only if they are of strategic value.

Eucalyptus viminalis/Eucalyptus globulus coastal forest (Old Growth)

Dominant trees:	*E. globulus, E. viminalis, E. obliqua*
Secondary trees:	*Acacia verticillata, Melaleuca squarrosa, Bedfordia salicina, Pomaderris apetala, Banksia marginata, Allocasuarina verticillata*
Shrubs:	*Zieria arborescens, Leucopogon parviflorus, Banksia marginata, Monotoca elliptica, Coprosma quadrifida, Acacia genistifolia*
Graminoides:	*Lepidosperma ensiforme, Poa poiformis, Lomandra longifolia*
Ferns:	*Pteridium esculentum*
Structure:	Tall open/closed forest. This community equates to Coastal shrubby *Eucalyptus viminalis* forest (Kirkpatrick *et al.* 1995).

Grassy *E. globulus* forest (Old Growth)

Dominant trees:	*E. globulus, E. obliqua*
Secondary trees & tall shrubs:	*Acacia melanoxylon, Acacia verticillata, Bursaria spinosa, Exocarpos cupressiformis, Pittosporum bicolor, Notelea ligustrina, Melaleuca squarrosa, Bedfordia salicina, Pomaderris apetala, Banksia marginata, Allocasuarina verticillata*
Shrubs:	*Zieria arborescens, Leucopogon parviflorus, Monotoca elliptica, Coprosma quadrifida, Beyeria viscosa, Pultenaea daphnoides, Pimelea drupacea*
Graminoides:	*Lepidisperma ensiforme, Gahnia grandis, Dianella tasmanica, Lomandra longifolia*
Ferns:	*Pteridium esculentum, Microsorum pustulatum, Histiopteris incisa, Dicksonia antarctica, Cyathea australis, Hymenophyllum cupressiforme, Polystichum proliferum*
Structure:	Tall open/closed forest. Three facies of this community are present, they are: *Eucalyptus globulus-Dicksonia antartctica-Ctenopteris heterophylla* wet sclerophyll forest (Kirkpatrick *et al.* 1995), located along the creekline in the freehold block at Canoe Bay and *Eucalyptus globulus-Bedfordia salicana-Beyeria viscosa* wet sclerophyll forest (more moist sites) (Kirkpatrick *et*

al. 1995) and Grassy *Eucalyptus globulus-Eucalyptus viminalis* dry sclerophyyl forest (Kirkpatrick *et al.* 1995) (dryer sites). These latter two occupy a continuous strip around the rocky shoreline.

Eucalyptus obliqua - dry forest (Old Growth)

Dominant trees: *E. obliqua*, (*E. globulus, E. viminalis* occasional)

Secondary trees: *Allocasuarina littoralis*

Shrubs: *Zieria arborescens, Acacia verticillata, Acacia myrtifolia, Bursaria spinosa, Bedfordia salicina, Leucopogon parviflorus, Banksia marginata, Monotoca elliptica, Leptospermum scoparium, Epacris impressa, Hibbertia riparia, Hakea teretifolia, Correa lawrenciana, Exocarpos strictus, Acacia genistifolia*

Graminoides: *Lomandra longifolia*

Ferns: *Pteridium esculentum*

Structure: Tall open forest. This community equates to Shrubby *Eucalyptus obliqua* forest (Kirkpatrick *et al.* 1995).

Eucalyptus obliqua - Wet forest (Old Growth)

Dominant trees: *E. obliqua* (*E. globulus* occasional)

Secondary trees & tall shrubs: *Acacia melanoxylon, Pomaderris apetala, Olearia argophylla, Bedfordia salicina, Melaleuca squarrosa*

Shrubs: *Acacia verticillata, Monotoca glauca, Monotoca elliptica, Coprosma quadrifida, Beyeria viscosa, Pimelea drupacea*

Graminoides: *Lepidosperma ensiforme, Gahnia grandis, Carex appressa*

Ferns: *Microsorum diversifolium, Histiopteris incisa, Dicksonia antarctica, Cyathea australis, Hymenophyllum cupressiformis, Polystichum proliferum, Pteridium esculentum*

Structure: Tall open/closed forest. Two facies of this forest type are present: *Eucalyptus obliqua - Acacia dealbata - Olearia argophylla* wet sclerophyll forest and *Eucalyptus obliqua - Melaleuca*

squarrose - *Monotoca glauca* wet sclerophyll forest (Kirkpatrick *et al.* 1995).

Eucalyptus tenuiramis - forest on dolerite (Old Growth)

Dominant trees: This forest is very similar to Dry *Eucalyptus obliqua* forest in both structure and floristic composition and is distinguished by the presence of *E. tenuiramis* as a co-dominant tree species.

Structure: Open forest. This community equates to Shrubby *Eucalyptus tenuiramis* forest (Kirkpatrick *et al.* 1995).

Non-forest / Coastal Communities

These communities have been assessed against relevant existing conservation status reports as is reported in the text, however these assessments are currently under review as part of the Vegetation component of the South East Coast Integrated Coastal Management Strategy. In general these communities have not been subject to condition analysis in the past and consequently many areas that have been classified as contributing to the security of these communities are, in fact, heavily weed invaded and subject to disturbance. This situation is exacerbated by the age of much of the existing data, some of which is now more than two decades old.

Shrubby coastal heath/tall and wind pruned coastal scrub

Conservation status: Well reserved in Tasmania. However at most locations in South East Tasmania dune heath and scrub has been highly disturbed and replaced by Marram Grass, simplified communities dominated almost solely by *Acacia sophorae*, or pasture and other weed and garden species. Consequently the status of this community has upgraded to under some level of threat over the majority of its range within the bioregion.

Condition: The condition of this community within the area surveyed is currently 2.

Vulnerability: Highly vulnerable to trampling and fire with subsequent dune blowouts and invasion and replacement by Marram Grass.

Dominant shrubs: *Acacia sophorae, Leucopogon parviflorus, Banksia marginata, Cyathodes juniperina, Olearia phlogoppapa, Monotoca elliptica, Calytrix tetragona*

Graminoides and herbs: *Ehrharta* sp., *Poa poiformis, Lepidosperma ensiforme, Lomandra longifolia, Scleranthus* sp., *Pelargonium australe*

Ferns: *Pteridium esclentum*

Structure: This community is the equivalent of *Banksia marginata-Leucopogon parviflorus-Pteridium esculentum* heath/scrub (Kirkpatrick *et al.* 1995). It grades from dense low heath on the front of the foredune to tall scrub on the foredune crest and behind, and finally merges with *Eucalyptus viminalis/Eucalyptus globulus* coastal forest on established dunes and swales further inland.

Coastal grass and herbfields

There are three distinct communities in the study are which fall within this VMS category. They are:

Spinifex sericeus - Austrofestuca littoralis grassland

(Kirkpatrick *et al.* 1995)

Conservation status: Well reserved in Tasmania. However at most locations in South East Tasmania dune heath and scrub has been highly disturbed and replaced by Marram Grass, simplified communities dominated almost solely by *Acacia sophorae*, or pasture and other weed and garden species. Due to the preliminary findings of the South East Coast Integrated Coastal Management Strategy surveys the conservation status of this community has been elevated to under some level of threat over the majority of its range within the bioregion.

Condition: Condition 2 for all areas due to the invasion of Marram Grass.

Vulnerability: Highly vulnerable to trampling and fire with subsequent dune blowouts and invasion and replacement by Marram Grass.

Dominant species: *Spinifex sericeus, Austrofestuca littoralis, Carpobrots rossii, Juncus pauciflorus, Cakile* sp., *Ammophila arenaria, Stylidium graminifolium*

Structure: Open tussock grassland on the incipient fore-dune behind the high water mark.

Spinifex sericeus-Leucopogon parviflorus grassland/shrubland (Kirkpatrick *et al* 1995)

Conservation status:	Well reserved
Vulnerability:	Substrates of dolerite bedrock and/or dolerite cobbles and boulders make this community relatively robust to trampling and fire.
Condition:	Condition 1 for all areas.
Dominant species:	*Spinifex sericeus, Leucopogon parviflorus, Distichlis distichophylla, Juncus pauciflorus, Carex appressa, Poa poiformis, Schoenus apogon, Cotula* sp., *Lomandra longifolia, Dianella tasmanica*
Structure:	Open grassland/ shrubland occupying rocky dolerite shore lines in the study area.

Sedgeland/herbfield on alluvial sands at Bivouac Bay

The mouth of Bivouac Creek supports short sedgeland / herbfields composed of as yet unidentified sedge and herb species including *Plantago* sp. and *Cotula* sp. Further investigation is required during the flowering season. This community occurs on alluvial dolerite sand deposits at the mouth of the creek. There has been considerable erosion of the community and this erosion appears to be, at least in part, due to trampling. Increased pressure from trampling would pose a serious threat to the continued existence of the community.

Conservation Status:	Unknown. Probably under some level of threat over the majority of its range within the bioregion. Requires further investigation.
Condition:	Condition 2.
Vulnerability:	This community is threatened by trampling.

Appendix 3

Species recorded during the survey.

Pteridophyta	**Monocotyledonae**
Cyatheaceae	Cyperaceae
Cyathea australis	*Carex appressa*
Blechnaceae	*Gahnia grandis*
Blechnum nudum	*Lepidosperma ensiforme*
Dennstaedtiaceae	*Schoenus apogon*
Histiopteris incisa	Juncaceae
Pteridium esculentum	*Juncus pauciflorus*
Dicksoniaceae	Liliaceae
Dicksonia antarctica	*Dianella tasmanica*
Dryopteridaceae	Poaceae
Polystichum proliferum	*Agrostis* sp.
Hymenophyllaceae	* *Ammophila arenaria*
Hymenophyllum cupressiforme	*Austrofestuca littoralis*
Polypodiaceae	*Distichlis distichophylla*
Microsorum pustulatum	*Ehrharta sp.*
	Poa poiformis
	Spinifex sericeus
	Gahnia grandis
	Lepidosperma ensiforme
	Schoenus apogon
	Orchidaceae
	Pterostylis sp.
	Restionaceae
	Leptocarpus brownii
	Xanthorrheoaceae
	Lomandra longifolia

Dicotyledonae	**Dicotyledonae (cont)**
Aizoaceae	Myrtaceae
Carpobrots rossii	*Calytrix tetragona*
Asteraceae	*Eucalyptus globulus*
Bedfordia salicina	*Eucalyptus obliqua*
Cotula sp.	*Eucalyptus tenuiramis*
Helichrysum scorpioides	*Eucalyptus viminalis*
Olearia argophylla	*Leptospermum lanigerum*
Olearia lirata	*Leptospermum scoparium*
Olearia phlogoppapa	*Melaleuca squarrosa*
Ozothamnus ferrugineus	Oleaceae
Senecio lautus	*Notelea ligustrina*
Senicio sp.	Oxalidaceae
Brassicaceae	*Oxalis* sp.
* *Cakile* sp.	Pittosporaceae
Caryophyllaceae	*Bursaria spinosa*
Scleranthus sp.	*Pittosporum bicolor*
Casuarinaceae	Polygalaceae
Allocasuarina stricta	*Comesperma volubile*
Allocasuarina littoralis	Proteaceae
Dilleniaceae	*Banksia marginata*
Hibbertia riparia	*Lomatia tinctoria*
Epacridaceae	Rhamnaceae
Cyathodes juniperina	*Pomaderris apetala*
Epacris impressa	Rosaceae
Leucopogon parviflorus	*Acaena novae-zelandiae*
Monotoca elliptica	Rubiaceae
Monotoca glauca	*Coprosma quadrifida*
Euphorbiaceae	Rutaceae
Beyaria viscosa	*Correa lawrenciana*
Fabaceae	*Zieria arborescens*
Pultenea daphnoides	Santalaceae
Geraniaceae	*Exocarpos cupressiformis*
Pelargonium australe	*Exocarpos strictus*
Mimosacea	Sapindaceae
Acacia genistifolia	*Dodonaea viscosa*
Acacia melanoxylon	Styllidiaceae
Acacia myrtifolia	*Stylidium graminifolium*
Acacia sophorae	Thymelaeaceae
Acacia verniciflua	*Pimelea drupacea*
Acacia verticillata	*Pimelea nivea*
	Urticaceae
	Urtica incisa
	Violaceae
	Viola hederaceae