A classification of the lands at wilson's promontory - Second Edition

July 1999

CENTRE FOR LAND PROTECTION RESEARCH

Technical Report No. 43

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ISBN **0 7306 6778 2**

ISSN **1038-216X**

Sibley, G. T.

A classification of the lands at Wilson's Promontory

2nd ed.

Bibliography.

Includes index.

ISBN 0 7306 6778 2.

1. Land use –Victoria – Wilson's Promontory – Classification. I. Centre for Land Protection Research. II. Title. (Series: Technical report (Centre for Land Protection Research (Vic)); no. 43).

333.73099456

PREFACE

This report is a new edition of study by Sibley (1966) of the land types of Wilson's Promontory. There are a number of reasons why a new edition was deemed warranted.

Firstly, there is little obviously available information on the land types of Wilson's Promontory that cover the whole geographic area. The original report by Sibley fulfils this need, but there are very few copies of the original report, thereby reducing the likelihood of knowledge and usage of the original report. Therefore a revised, more readily available edition was necessary.

Secondly, there is the question of scale and intensity of information. This report on Wilson's Promontory is important for land use managers as it provides the basic spatial mapping units for the Statewide Land System (Rowan, 1990) coverage (scale 1:250 000), even though it was regarded by Sibley (1966) as a reconnaissance survey and a framework for further study.

Thirdly, there is the question of the age of the information and the form that it is in, such as the classification systems used for soil and vegetation types. This has been addressed by updating the classification systems and assessments used for soil and vegetation identification. There has been no further field data gathered specifically for this report.

Fourthly, there is the question of presentation which is relevant to the potential use of the information, including editing. The electronically stored new edition presents the original in an updated edited format including new diagrams.

This edition has been edited, courtesy of Leisa Macartney, Angela Smith and Grant Boyle of the Centre for Land Protection Research. The diagrams have been redrawn by Grant Boyle, although the main map may need some ground truthing due to the lack of suitable reference points and the reconnaissance nature of the original study. The vegetation classification has been updated with notes on current and likely changes (Grant Boyle, David Rees), and the soil classification system has also been updated by David Rees (see Appendix 1).

It is hoped that this edition will provide a useful, current overview of land types on Wilson's Promontory and facilitate an understanding of any future information requirements of land types and their behaviour.

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A CLASSIFICATION OF THE LAND AT WILSON'S PROMONTORY

Original publication 1966. Second edition published 1999.

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INTRODUCTION

Wilson's Promontory has been divided into the following units of land classification at five levels of details:

Regions (2)
Land-Zones (5) } least detailed
Land-Systems (9)
Land-Units (15) } most detailed
Land-Components (20)

The criteria used to recognise and map these various units of classification are certain features of the environment, namely land-forms, parent material, soil and native vegetation.

The land-systems are indicated on the accompanying map by colours and numbers, while the land-units are indicated by letters. Figures 2 to 16 illustrate and summarise the land-units. The areas occupied by the regions and land-zones can be recognised by groupings of colours, that is, by groupings of land-systems. The relationships of the regions, land-zones, land-systems and land-units to each other are shown in Table 1. A more detailed survey of the Promontory could well have revealed a greater number of land classification units, particularly land-units and land-components.

1 REGION NO. 1 - LAND ASSOCIATED WITH GRANITE

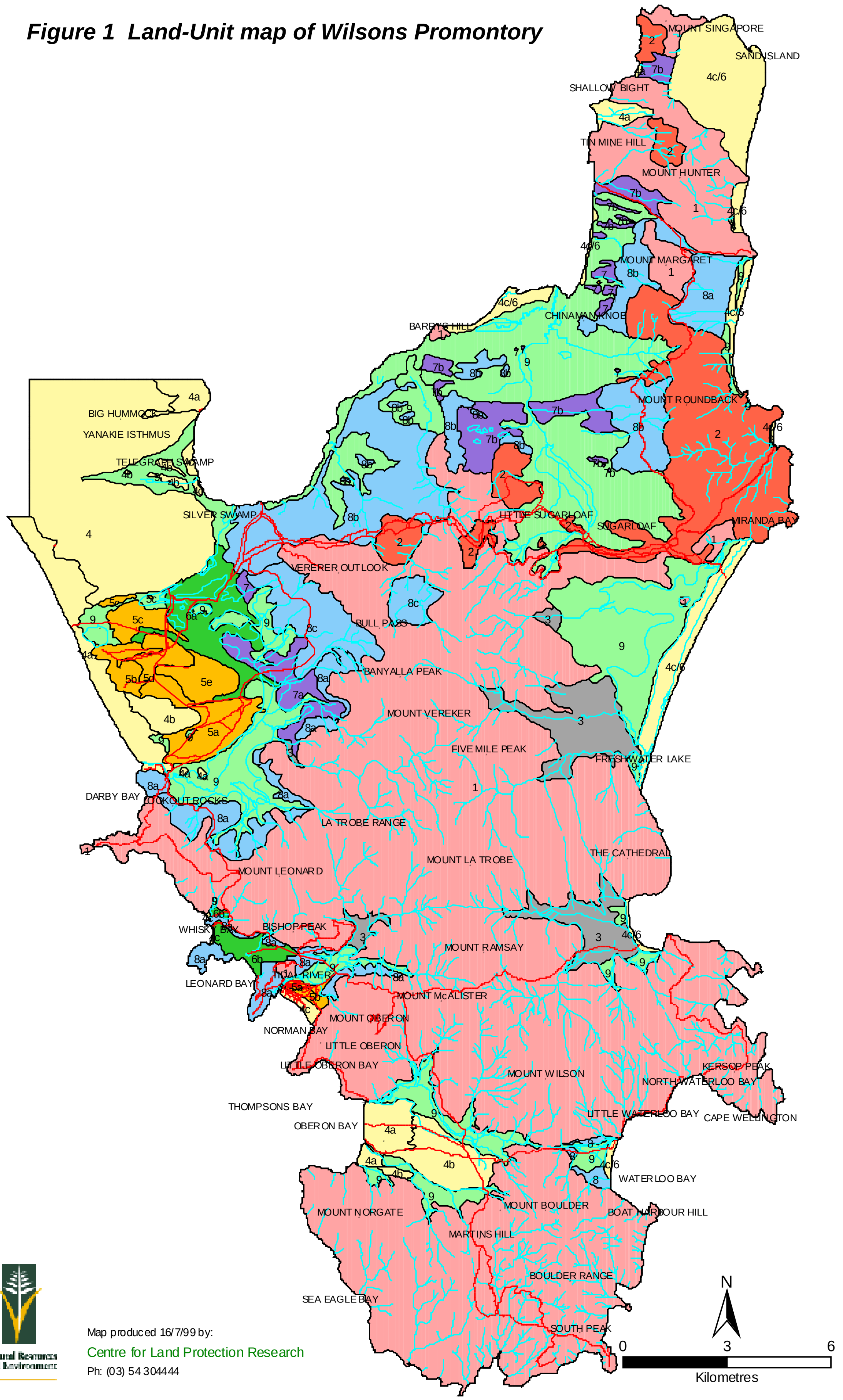
The initial division of Wilson's Promontory is into two regions, namely, areas associated with Devonian granite, and areas associated with deposits of Quaternary (Pleistocene and Holocene) sand. This follows the less detailed geological maps available.

Table 1 Land-Units of Wilson's Promontory

REGION	LAND-ZONE	LAND-SYSTEM		LAND-UNIT
1. Land associated with granite	PROMONTORY (Areas of granite)	1	Mountains and hills with eucalypt forests and scrubs	
		2	Hills with mostly treeless heaths	
	SEALER'S COVE (Areas of granite hillwash)	3	Flat sheltered areas with wet forests	
2. Land associated with deep deposits of sand	YANAKIE SOUTH (Areas of dunes associated with alkaline sand and neutral to slightly acidic sand)	4	Dunes of loose 'pale yellow' alkaline sand	4a, 4b, 4c
		5	Dunes of dune limestone and dunes of 'red' neutral to slightly acidic sand	5a, 5b, 5c, 5d, 5e
	LEONARD BAY (Areas of sand dunes and sand sheets composed of 'white' very acidic sand)	6	Sand dunes	6a, 6b
		7	Flat sand sheets	7a, 7b
		8	Sloping sand sheets (overlaying granite)	8a, 8b, 8c
	CHINAMAN'S CREEK (Low-lying sand sheets with restricted drainage and soils high in organic matter)	9	Wet heaths and swamps	

* refer to Figure 1

Figure 1 Land-Unit map of Wilsons Promontory



Map produced 16/7/99 by:

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Natural Resources and Environment

The areas associated with granite (Region 1) are divided into two land-zones (see Table 1). **Promontory Land-Zone** comprises the hills and mountains of granite, and it in turn is The subdivided into Land-Systems 1 and 2. **Sealer's Cove Land-Zone** comprises flat areas built up of sandy and clayey deposits of granitic hillwash and constitutes Land-System 3.

Little time was spent in studying the land in Region 1, therefore the three land-systems have not been examined in sufficient detail to allow for the recognition of land-units and land-components. More field work is required to record the land-forms, soils and native vegetation. However, from the work done thus far, it seems likely that the granite areas, particularly the hills and mountains of Land-System 1, are not so readily subdividable in the same way as the areas of Quaternary sand in Region 2, which have been subdivided into 15 land-units. It could be that it is impracticable to recognise land-units within the three land-systems of Region 1.

1.1 Promontory Land-Zone

1.1.1 Land-System 1

This land-system is by far the largest of all the land-systems in the survey area. It occupies most of the granite hills and mountains, and includes those hills and mountains that are covered, in the main, with eucalypt forest and scrub communities.

Any future division of the land-system into land-units would probably be on the basis of the native vegetation. It would be a major study in itself to describe and map the numerous plant communities and their habitats. There is a wide range of habitats and communities, their form and composition have been severely altered by recurrent bushfires since European settlement of Gippsland; access into the mountains is almost non-existent. This report has recorded the floristics and structure of some of the more important communities, and can be designated as land-components:

(i) areas of outcropping rock - these are a noticeable feature of the land-system. The dominant species are lichens and mosses.

(ii) treeless heaths - these grow in both comparatively dry and comparatively wet habitats. Generally, the heaths in the drier sites have *Kunzea ambigua* as the dominant species, whereas the heaths in wetter sites are dominated by *Melaleuca squarrosa, Leptospermum continentale,* and a pink-flowered species that may be Pink Beard-Heath. Both heath communities in the land-system are not widespread but rather are minor components.

(iii) scrubs - stunted eucalypt communities, generally less than about three metres in height. *Eucalyptus baxteri* is the dominant species, and one of the peppermints probably *E. willisii* is often present also. There is a well-developed heath ground flora, which includes *Allocasuarina paludosa*, *Xanthorrhoea australis, Leptospermum myrsinoides, Banksia marginata* and *Hakea sericea* as important species.

(iv) dry sclerophyll forests - there is a number of associations represented in the dry sclerophyll forest communities, the most common of which are those that include *E. baxteri, E. obliqua,* and a peppermint *(E. dives* or *E. radiata).* The dry sclerophyll forests are probably the most widespread of the sub-formations in the land-system. They have been severely damaged by bushfires during the past 100 years, and, in some areas, their re-establishment has been very slow and they appear to be more like scrub communities. A study of the ecology of the scrubs and dry sclerophyll forests is made more difficult by the bushfire influence.

(v) wet sclerophyll forests - common eucalypts in this sub-formation are *E. obliqua* and *E. cypellocarpa*. A blue gum (*E. globulus)* also occurs in a number of areas. *E. regnans* is present also in a few sheltered sites. Some of the common understorey species are *Pomaderris apetala, Bedfordia arborescens* and tree-ferns.

(vi) rainforest - patches of what might be termed cool temperate rainforest occurs in sheltered, moist gullies between the hills. Lilly pilly is a prominent tree species, and clematis and other lianas help to characterise the vegetation.

The soils in the land systems generally can be placed into the podzolised duplex soils and acid brown earths, which are described in Section 2.

1.1.2 Land-System 2

This is the second, and by far smaller, of the two land-systems on granite. It is found in the northern and north-eastern parts of the National Park, and is recognised by its extensive areas of treeless heath, although there are small patches of forest and scrub scattered throughout.

The heath communities are both short (1 m) and stunted (less than 1 m). Mostly, the following species are numbered among the dominant members of the communities: *A. pusilla, A. paludosa, Hakea sericea, H. ulicina,* a third *Hakea* species unidentified for this report, *B. marginata, Isopogon ceratophyllus, L. continentale.* In addition to these communities, which are in comparatively dry sites, there are other heath communities in wetter sites where seepage lines raise the moisture status of the soil. The dominant species differ, with species such as Pink Beard-Heath and Flat Cord-Rush. These wetter areas appear to bear no necessary causal relationship to topography and lines of drainage due to occurrences of species on steep convex slopes near the tops of hills. There may be a relationship between species and lines of seepage originating from fractures and joints in the granite. The patches of scrub in the land-system are made up of *E. obliqua* and/or *E. baxteri.* In addition, woodland stands of *B. serrata* form another minor plant community.

The soil of the heath communities and the eucalypt scrub is a podzolised duplex soil, whereas the soil of the *B. serrata* woodlands is a very deep, sandy nomopodzol, which is quite different from the podzolised duplex soil. Both groups of soils are described in Section 2. For reasons outlined in Land-System 8, it is thought that the small, scattered deposits of fine sand of the *Banksia* woodlands are of wind-blown origin and bear no direct relationship to the granite hills. Where these deposits are extensive they have been separated and mapped as part of Land-System 8, but those that are too restricted for this are included within Land-System 2 as land-components.

1.2 Sealer’s Cove Land-Zone

1.2.1 Land-System 3

The separation of Land-System 3 was made by aerial photo-interpretation, however there has been no field work to check it. Therefore, no precise information on soils and vegetation can be given, so the land-systems should be regarded as provisional until such time as a ground survey is conducted. The interpretation of the model viewed under the stereoscope is that of flat or gently sloping areas in sheltered sites at the base of the granite mountains, with a dense, moist wet sclerophyll forest or rainforest. Presumably the soils have formed in deep deposits of granitic hillwash. The land-system was identified under the stereoscope in five localities, namely, the valley facing Sealer’s Cove, two areas behind Five Mile Beach, a narrow valley to the east of Darby River and the upper section of Tidal River valley.

2 region No. 2 - land associated with deep deposits of sand

The deep deposits of sand that make up Region 2 are given a Quaternary age (Pleistocene and Holocene) by geologists. The region is divided into three land-zones, as indicated in Table 1.

Yanakie South Land-Zone includes areas of dunes composed of 'pale yellow' alkaline sand, 'red' slightly acidic to neutral sand, and a soft rock called dune limestone (or aeolianite), which is very similar in composition to the alkaline sand. These three materials are related to each other in composition and formation, and have been used as the basis for subdividing Yanakie South Land-Zone into Land-Systems 4 and 5. In turn, these two land-systems are divided into land-units. The land-units within each land-system share the same parent materials, land-forms, soils and native plant species, all of which characterise that land-system, but the land-units are a means of highlighting important variations within the land-system in the arrangement or pattern of those environmental features.

Leonard Bay Land-Zone takes in the deep deposits of white, very acidic sand sheets and have been used to subdivide the land-zone into Land-Systems 6, 7 and 8. Each of these have been divided into land-units on the same basis as that used for the land-systems in Yanakie South Land-Zone.

Chinaman's Creek Land-Zone includes flat, low-lying sand sheets with restricted drainage and soils high in organic matter. The area occupied by the land-zone is mapped as Land-System 9.

2.1 Yanakie South Land-Zone

2.1.1 Land-System 4

Land-System 4 incorporates dunes composed of loose, 'pale yellow' alkaline sand. This sand is made up of two distinct materials, namely, finely broken calcareous sea-shells and quartz grains, of which the sea-shells make up 60 to 70 per cent of the total sand grains. Alkaline reposal soils have developed in the sand and their description is given in Section 2. A very common plant community in the land-system is a dry scrub dominated by all or some of the following species:

Leptospermum laevigatum, Leucopogon parviflorus, Acacia verticillata, Acacia longifolia and *Bursaria spinosa*.

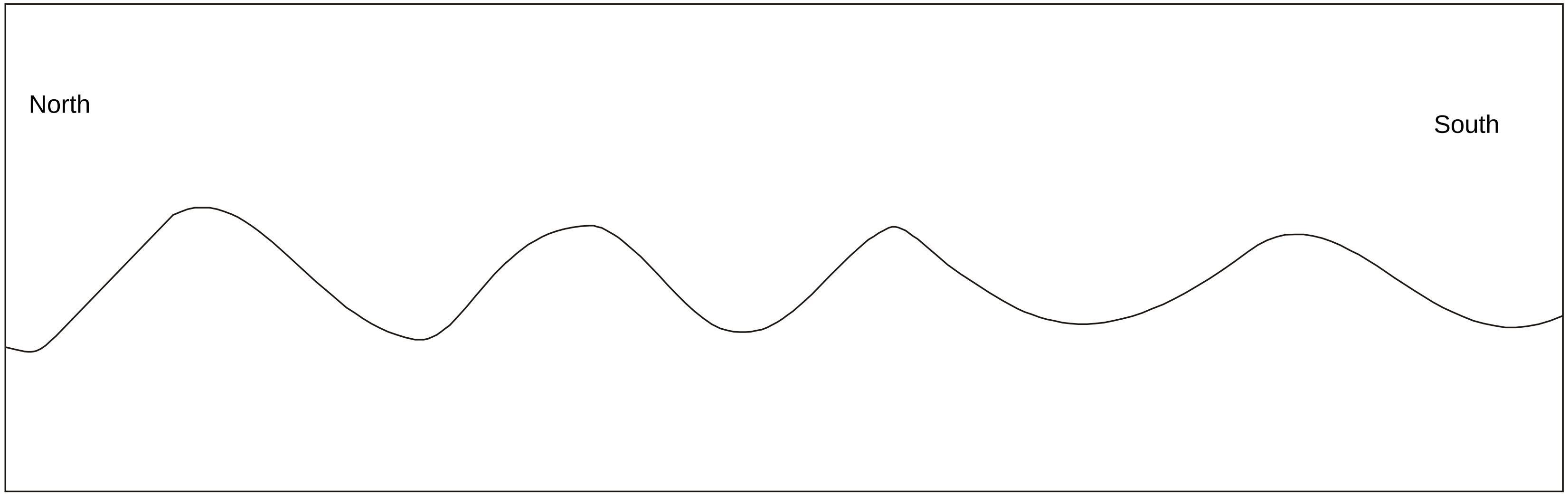
The land-system occurs behind many of the beaches in the National Park and the most extensive single area stretches across the Yanakie Isthmus.

Three land-units have been recognised within the land-system, and the features used to distinguish each of them relate to difference in the shape, dimensions and direction of orientation of the dunes. There are also differences of lesser importance in the vegetative cover.

Land-Unit 4a

A summarised description of the land-unit is given in Figure 2. The land-unit comprises the large, massive sand dunes mainly found along the western beach of the Yanakie Isthmus, and also facing Oberon Bay and Corner Inlet. The dunes are orientated at right angles to the beach, and most have no plant cover and so are subject to movement by the wind. They are close to one another, that is, the inter-dune corridors (or swales) are very narrow and, in places, almost non-existent. Compared with the dunes in Land-Unit 4b, these dunes have a wider cross-section in relation to their height so that their sides are not as steep and tend to be convex in outline. Their height is estimated to be generally within the range of 9-25 metres, although the highest appear to be over 30 metres. A few of the dunes have a core of dune limestone, but the overall frequency of this is unknown.

In a few places, the land-unit takes in parts of granite hills along the coast because of the presence of dunes on the sides of the hills. Evidently the on-shore winds have been strong enough to lift the sand up the sides of the hills where it has been stabilised by scrub vegetation. An example of this is to be seen above the sand bar that lies across the mouth of the Darby River. Also at this site, the sand of the dunes is underlain by dune limestone showing that the dunes have been held in position on the side of the hill for a sufficient length of time to allow the dune limestone to form.



Landform	Large massive sand dunes at right angles to the beach.
Geology	Wind-blown calcareous sand of predominantly broken sea shells; with quartz grains.
Soil	Alkaline regosol
Native Vegetation	Most of the land-unit has no plant cover and is damaged by wind erosion. Facing the beach, marram grass and a low scrub of *Leptospermum laevigatum* are dominant. Inland, the vegetation changes to a taller dry scrub of *Leptospermum laevigatum*, *Leucopogon parviflorus*, *Allocasuarina stricta, Acacia sophorae* and *Bursaria spinosa*.

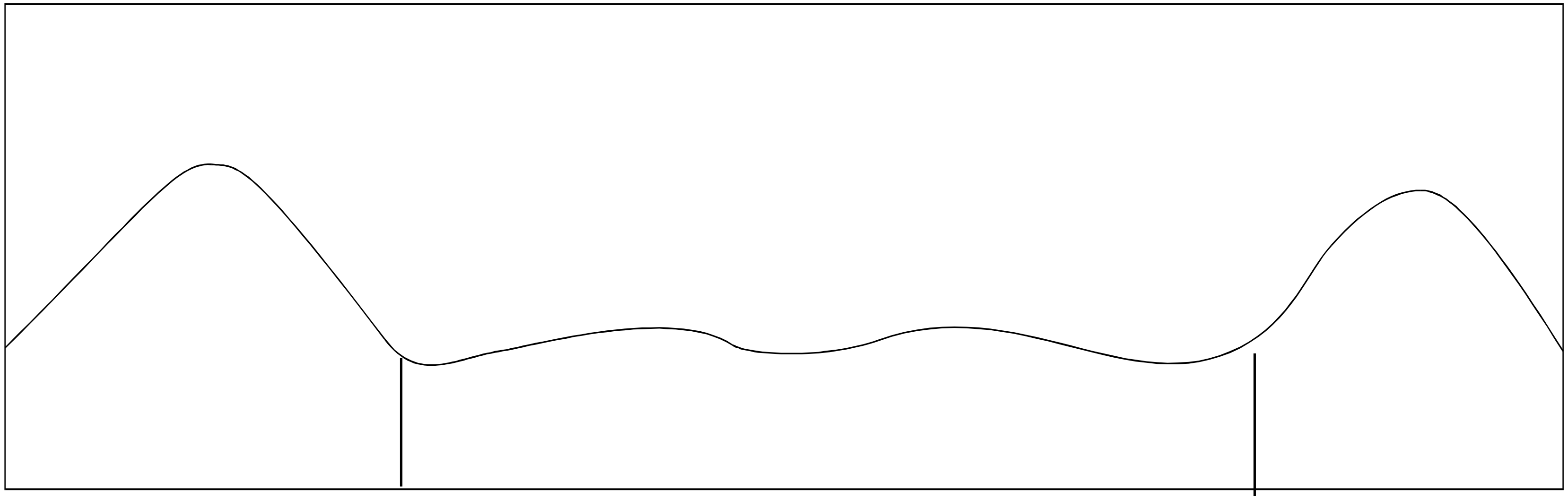
Figure 2 ***Land-Unit 4a (Land-System 4)***

Land-Unit 4b

A summarised description of the land-unit is given in Figure 3. Land-Unit 4b consists of massive sand dunes of unusual shape separated in many parts by wide inter-dune corridors upon which lie very small dunes. In some parts of the land-unit, the massive dunes are closely spaced making the interdune corridors rather narrow. The unusual shape of the massive dunes is caused by their very long main axes which turn back sharply to form long, sinuous and seemingly jumbled land-forms. The overall direction of orientation of these dunes is at right angles to the beach. Their height corresponds to the estimates given for the dunes in Land-Unit 4a, but their width is smaller in relation to height, making their sides steeper. Some of the dunes have a core of dune limestone, but the overall frequency of this is unknown.

The land-unit is found on the inland (leeward) side of Land-Unit 4a, and its massive dunes are covered and stabilised by a dry scrub vegetation of the species listed in Figure 3 and are the same as those growing in Land-Unit 4a. The interdune corridors and small dunes generally support and are stabilised by a grassland community (see species list, Figure 3), although scattered trees and shrubs do grow in some localities.

The map shows Land-Unit 4b to be largely on the Yanakie Isthmus between the northern boundary of the proposed extension to the National Park and Darby River (Figure 1). There is also a smaller area in the valley behind Oberon Bay



<table>
<tr><td>Landform</td><td colspan="3">High, very steep sand dunes and very low, small dunes</td></tr>
<tr><td>Geology</td><td colspan="3">Wind-blown calcareous sand of predominantly broken sea shells, with quartz grains.</td></tr>
<tr><td>Soil</td><td colspan="3">Alkaline regosol, hydromorphic variants occur in the lowest and wettest sites between the small dunes, that is, higher amounts of organic matter giving darker and deeper surface horizons.</td></tr>
<tr><td>Native Vegetation</td><td>Dry scrub of Leptospermum laevigatum, Leucopogon parviflorus, Allocasuarina stricta, Acacia sophorae, Bursaria spinosa.</td><td>Mostly grassland dominated by Imperata cylindrica; Isolepis nodosa and Gahnia spp. grow in wettest parts. Scattered trees of Banksia integrifolia; shrubs of Leptospermum laevigatum and Leucopogon parviflorus grow in a number of areas.</td><td>Species listed on the left</td></tr>
</table>

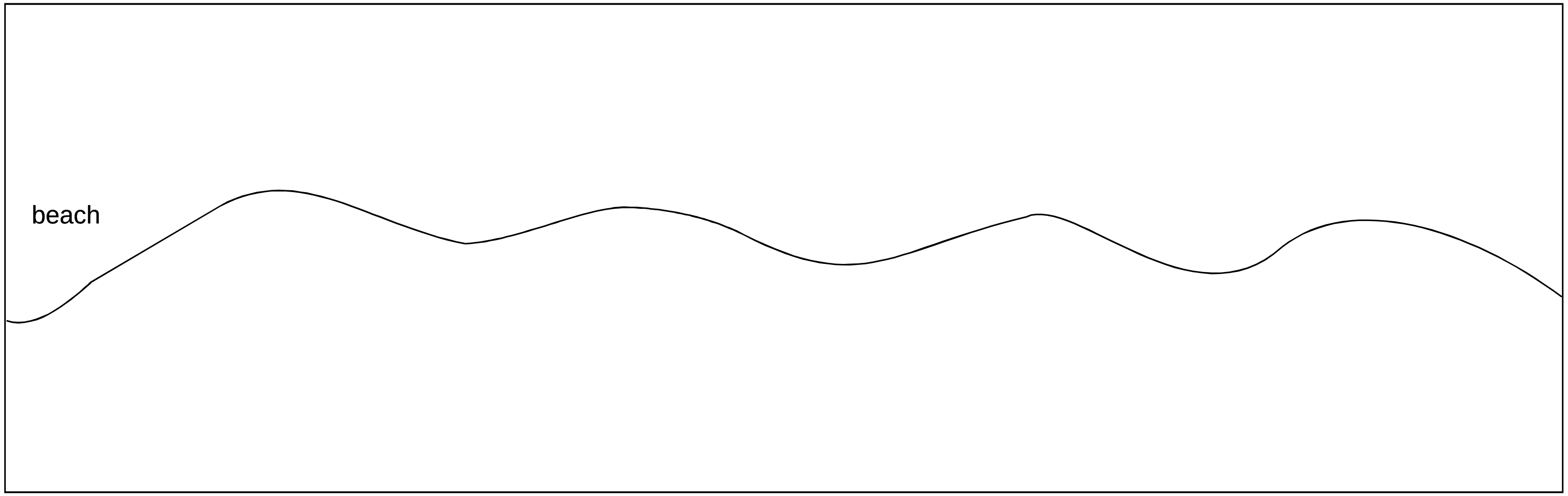
Figure 3 Land-Unit 4b (Land-System 4)

Land-Unit 4c

A summarised description of the land-unit is given in Figure 4. Land-Unit 4c is readily distinguished from the two previous land-units by the size of its dunes and their direction of orientation. They are parallel to the beach and much smaller in size (no more than about six metres in height). The soils and plant communities are similar to those in Land-Units 4a and 4b.

The only area of the land-unit positively identified is at the Tidal River camping ground. There are a number of other areas along the east coast beaches, and facing Corner Inlet, that are marked on the map as 4c or 6 because, although the dunes in these areas are parallel to the beaches, no study has been made of the sand to find out whether it is composed of mainly broken sea-shells, and therefore alkaline, or solely of quartz grains and therefore acidic. If the former, the areas come within Land-Unit 4c, but if the latter, they should be placed in Land-System 6 and an additional Land-Unit designated as 6c.

In a number of areas of 4c or 6 there are long, narrow, wet heaths and swamps in the corridors between the parallel rows of dunes. The largest of these wet areas is indicated on the map as Land-System 9 but most are too small to separate out from Land-Unit 4c or 6.



Landform	Sand dunes parallel to the beach
Geology	Wind-blown sand of predominantly broken sea shells; with quartz grains.
Soil	Alkaline regosol
Native Vegetation	Dry scrub of *Leptospermum laevigatum*, *Leucopogon parviflorus* and *Allocasuarina stricta*. In some areas, the front dune has marram grass on the seaward side.

Figure 4 Land-Unit 4c (Land-System 4)

2.1.2 Land-System 5

Land-System 5 incorporates both the dunes formed of dune limestone and those formed of loose, ‘red’, neutral to slightly acidic sand. It is believed that the latter dunes are associated through their genesis with those formed of dune limestone in that the red sand was stripped and winnowed off the limestone dunes by wind. The two kinds of dunes are in close proximity to each other and intermingle to some extent. They occupy a consolidated area forming the land-system between Cotter Lake in the north and Darby River in the south.

The limestone dunes are larger than the dunes of red sand, with some reaching gigantic dimensions such as the two forming Red Hill between the aerodrome site and Darby River. They often have the smaller red dunes lying on them towards their eastern and southern slopes. Elsewhere, the red dunes are usually found to the leeward (north-east to south-east) side of the limestone dunes, which are assumed to be their points of origin.

The material composing the dune limestone is almost identical to that forming the pale yellow calcareous sand of the sand dunes in Land-System 4. That is, about 80 per cent of the sand grains is finely broken sea-shells, with the remainder as quartz grains. The freshly exposed limestone is soft and coarsely laminated, but its surface hardens considerably on prolonged exposure. Those dunes are considered to be older than the dunes in Land-System 4 due to the length of time elapsed during which the change from loose sand to soft rock took place.

Soils of four groups occur on and in the two types of dunes. Terra rossas and rendzinas are on the limestone dunes. Red iron leptopodzols and light yellowish brown alkaline sands constitute the red dunes. All these soils are described in Section 3. The alkaline sands occur as a core in many of the red dunes and their properties are almost identical to the properties of the alkaline sands in Land-System 4 and to the material composing the dune limestone. The red iron leptopodzols overlie the alkaline sands to a depth of 38 - 90 centimetres.

Three dominant plant communities are widespread throughout the land-system and they show consistent relationships with the soil groups. The first community is a tall dry scrub dominated by shrubs and small trees or *L. laevigatum, Leucopogon parviflorus, B. ntegrifolia, Allocasuarina verticillata* and *A. longifolia,* and is associated with the terra rossas and rendzinas on the dunes of dune limestone. The second community is a woodland of *B. integrefolia* with ground flora dominated by bracken; this is associated with the communities of *L. laevigatum, Leucopogon parviflorus* and *Bursaria spinosa* in some localities. The third plant community is a grassland composed mainly of native grasses, bracken and the sedge *Isolepis nodosa.* In some areas the dominant species are *Imperata cylindrica* (Bladey Grass) and *Isolepis nodosa,* and elsewhere bracken is co-dominant with a number of grasses and *Isolepis nodosa.* The grasslands are also associated with the red iron leptopodzols.

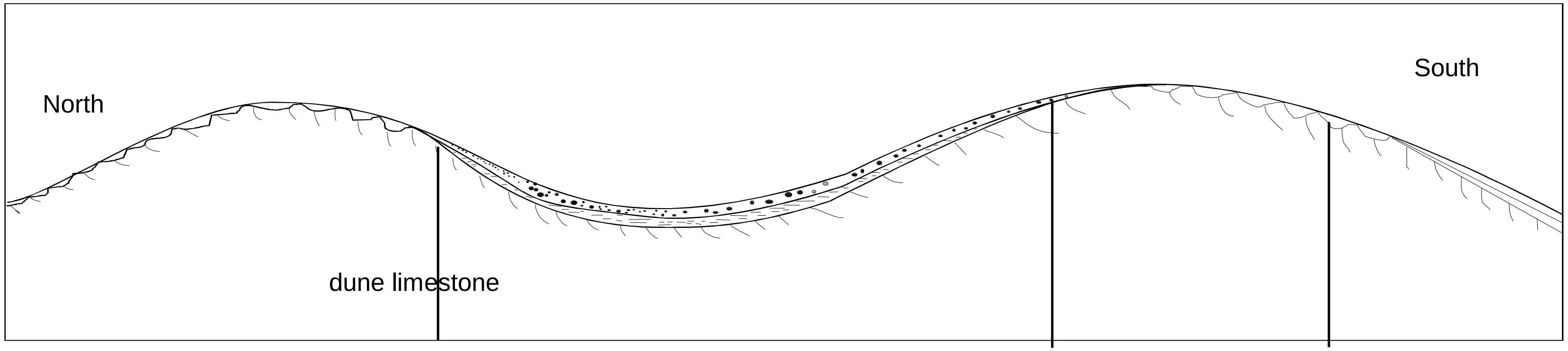
Land-system 5 is divided into five land-units to separate a number of different patterns formed by varying arrangements of the dune land-forms, soil groups and native plant communities.

Land-Unit 5a

This land-unit takes in the prominence known as Red Hill, which lies between the aerodrome to the north and Darby River to the south. Red Hill consists of two parallel gigantic limestone dunes separated by a ‘valley’ or corridor. Features are summarised in Figures 5a & 5b.

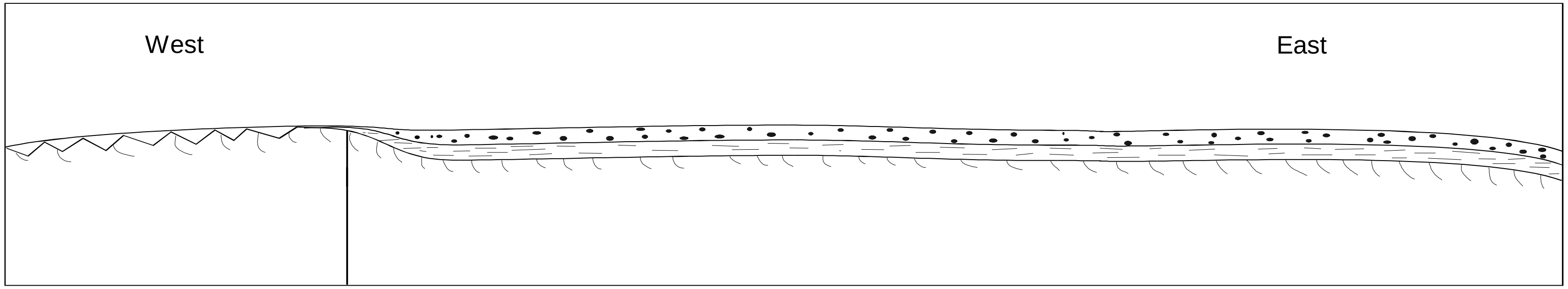
The ridges of the two dunes have both rendzinas and terra rossas. There are good examples of terra rossas along the north-facing slope of the northerly dune. Red iron leptopodzols are the most widespread soil group, and lie on the south-facing slope of the northerly dune and over the southerly dune, except along the ridge and western slope. In some parts, the deposits in which the leptopodzols have formed occur as small dunes.

The major plant communities are indicated in Figure 5a & 5b. There are also thickets of *L. laevigatum* regrowth in places along the ridges, which appear to be confined to the terra rossa soils.



Landform	Two very long and gigantic parallel dunes, 3 - 5 kilometres in length and 30 - 40 metres in height.			
Geology	Dune limestone and wind-blown sand.			
Soil	Terra rossa and rendzina	Red iron leptopodzol overlying a light yellowish brown calcareous sand	Terra rossa and rendzina	
Native Vegetation	Dry scrub of *Lepto. laevigatum, Leuco. parviflorus, Acacia sophorae, Allocasuarina stricta, Banksia integrifolia*	Woodlands of *B. integrifolia* with a ground flora dominated by bracken. Also grassland dominated by *Imperata cylindrica* and *Isolepis nodosa*.	Dry scrub as on left	

Figure 5A Land-Unit 5a (Land-System 5) showing north to south cross section.



Soil	Terra rossa and rendzina	Red iron leptopodzol overlying a light yellowish brown calcareous sand
Native Vegetation	Dry scrub of species listed above	Vegetation as in Figure 5A.

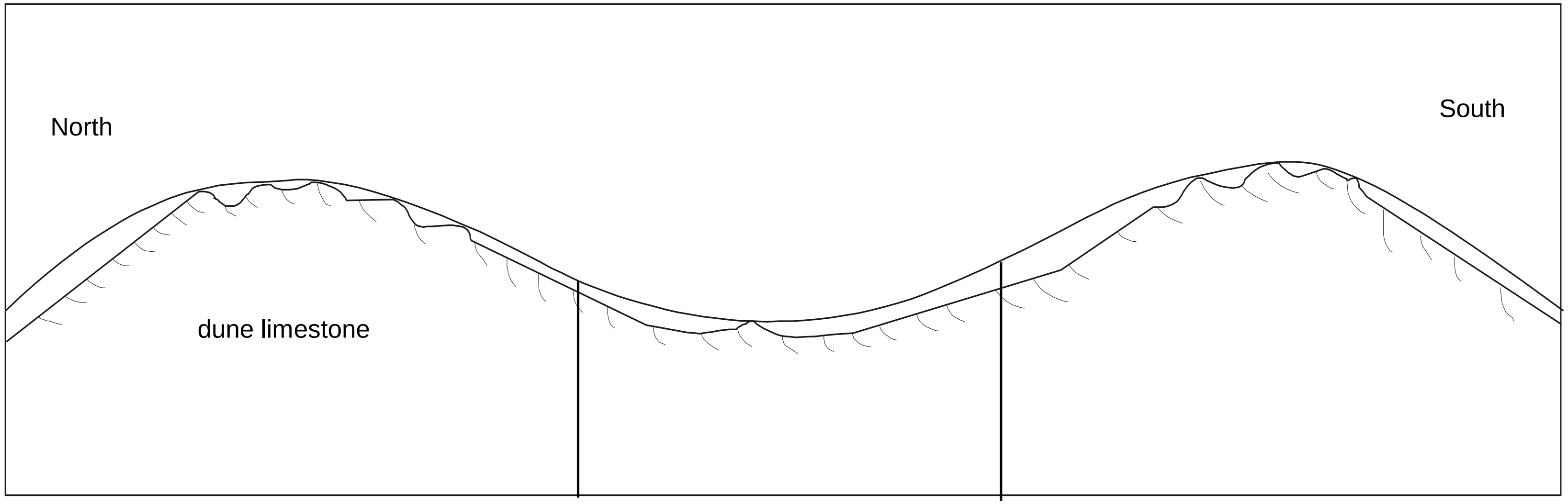
Figure 5B Land-Unit 5a (Land-System 5) showing west to east cross section.

Land-Unit 5b

Land-Unit 5b lies to the immediate south of Cotter Lake, and is made up of a series of four parallel dunes of dune limestone. These dunes are very big although not as big as those in Land-Unit 5a. The approximate dimensions of the dunes are given in Figure 6, together with a summary of the inter-relationships of their environmental features.

The rendzinas are usually deep (up to 1.5 metres) on the sides of the dunes and in the corridors, but on the ridges they are hollow with broken limestone in the soil. There are a few outcrops of limestone in the corridors and here, too, the soil is shallow. Red iron leptopodzols were found in a few sites, for examples, at the bases of the dunes and in small drainage lines running down the sides of the dunes.

The dominant plant communities are indicated in Figure 6. *Imperata cylindrica* and bracken are generally absent from the grasslands of the corridors and this is probably related to the presence of the rendzinas. The few small areas of bracken that do occur are indicative of the scattered deposits of red iron leptopodzols.



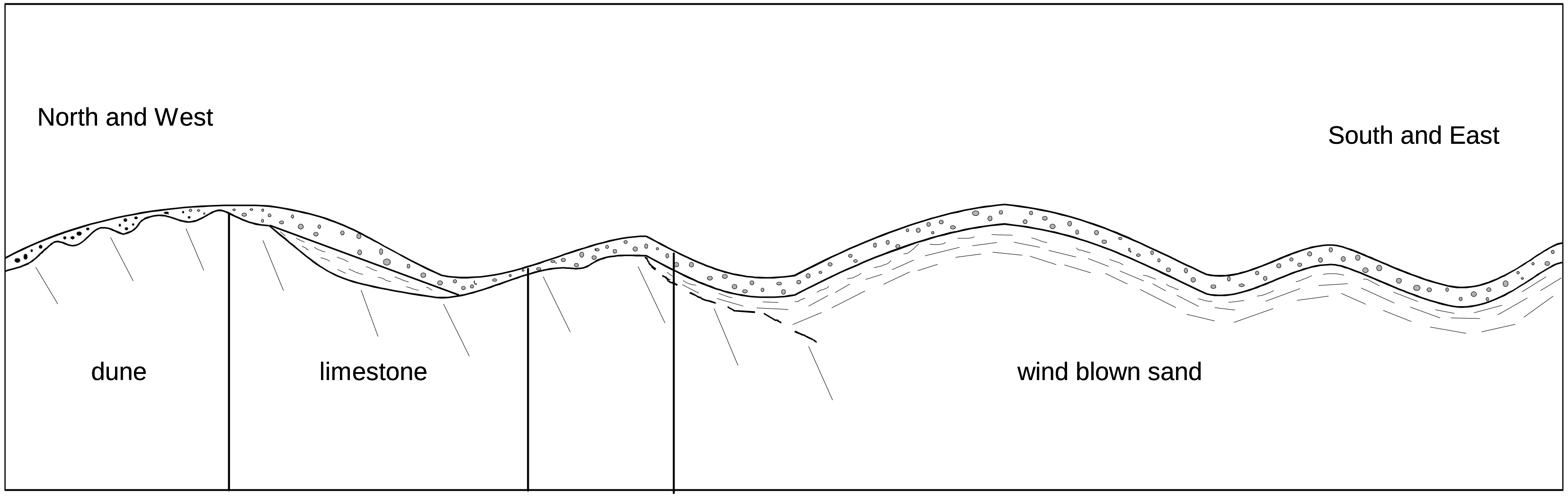
Landform	A series of parallel dunes, 15 m to 30 m in height and 400 m to 1000 m in length.		
Geology	Dune limestone and wind-blown sand.		
Soil	Mostly rendzina, although there are restricted areas of red iron leptopodzol and terra rossa		
Native Vegetation	Dry scrub of *Leptospermum laevigatum*, *Leucopogon parviflorus, Banksia integrifolia, Acacia sophorae, Allocasuarina astricta.*	Grassland of native grasses, *Isolepis nodosa*.	Dry scrub of species listed on left.

Figure 6 ***Land-Unit 5b (Land-System 5)***

Land-Unit 5c

Land-Unit 5c consists largely of small to medium-sized dunes which are characterised by deep red iron leptopodzols supporting woodlands of *Banksia integrifolia* (see Figure 7). Also characteristic is the bracken-dominant ground flora which is indicative of the leptopodzols.

Some of the larger dunes have cores of dune limestone, and in a few sites there are surface exposures of limestone with terra rossa soils. The prevalence of the dune limestone is unknown, however, it is thought that the deposits that do exist are confined to the larger dunes and are absent from the smaller dunes. The larger dunes are orientated in an east-west direction, but the small dunes do not have a constant line of orientation



Landform	Small and medium-sized dunes, between about 3m and 12 m in height			
Geology	Dune limestone and wind-blown sand.			
Soil	Terra rossa	Iron leptopodzol overlying calcareous sand	Terra rossa	Red iron leptopodzol overlying yellowish brown calcareous sand
Native Vegetation	Dry scrub of *Banksia integrifolia, Lepto. laevigatum, Leuco. parviflorus, Acacia sophorae*	Species listed on right	Species on the left	Generally a woodland of *Banksia intergrifolia* with a ground flora dominated by bracken. Also scattered understorey bushes of *Leptospernum laevigatum, Leucopogon parviflorus* and *Bursaria spinosa*

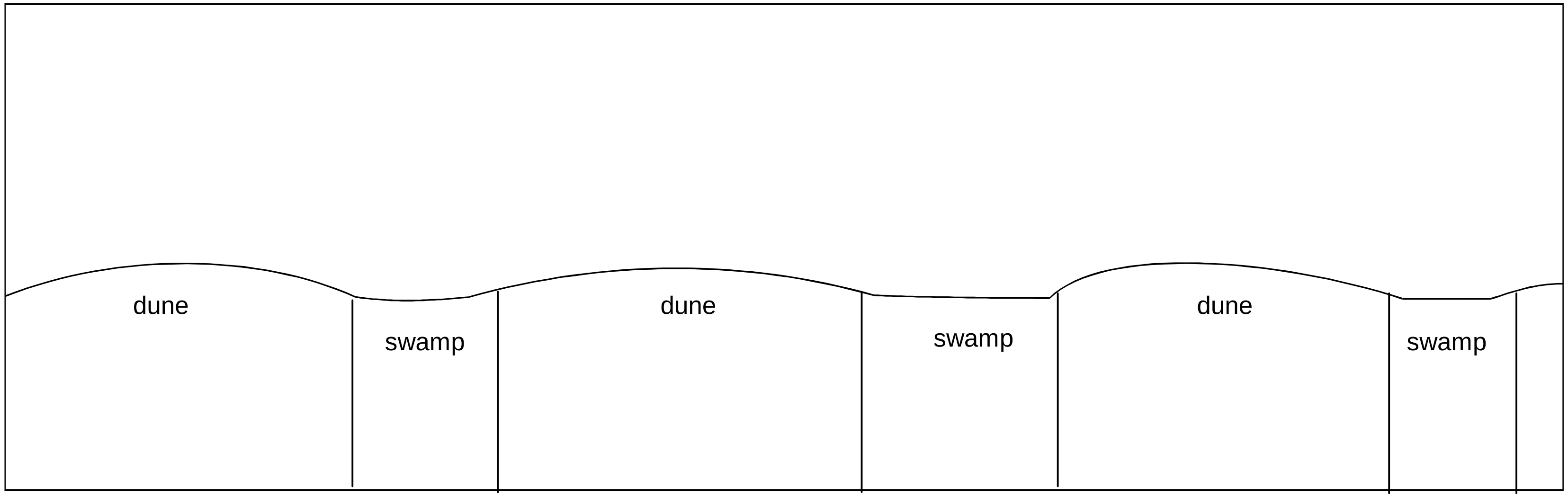
Figure 7 Land Unit 5C (Land-System 5)

Land-Unit 5d

The features of this land-unit are shown in Figure 8. The land-unit is distinguished from the three previous land-units by the presence of grasslands, the general lack of woodland and dry scrub communities, the low relief of dunes, and the presence of very small swamps in some of the inter-dune areas. The land-unit occurs along the main road between the Five Mile Road turn-off in the north and Red Hill in the south.

The dunes are quite low and without sharp crests, and so differ in shape from the dunes in all the previous land-units in Land-Systems 4 and 5. They could also be called sand rises. Generally they are orientated in a roughly east-west direction although many are curved.

The inter-dune areas are the wettest sites in the land-unit and some are permanent swamps with a fringe vegetation of tall *Melaleuca ericifolia* and *Melaleuca squarrosa*. Where no swamps prevail there is grassland with reeds and rushes, and a light brown sandy soil. No close study of the soil was made to determine its relationships to the two soil types in the dunes.



Landform	Low sand dunes, up to 4.5 m in height but mostly less than 3 m.						
Geology	Wind-blown deposits of quartz sand overlying calcareous sand.						
Soil	Red iron leptopodzol overlying a light yellowish brown calcareous sand	Light brown sand	As for far left column		As for far left column	Light brown sand	
Native Vegetation	"Grassland" of bracken, native grasses	Rushes sedges grasses	As for far left column	Wet scrub of tall *Melaleuca spp.* around edge	As for far left column	Rushes sedges grasses	

Figure 8 Land-Unit 5d (Land-System 5)

Land-Unit 5e

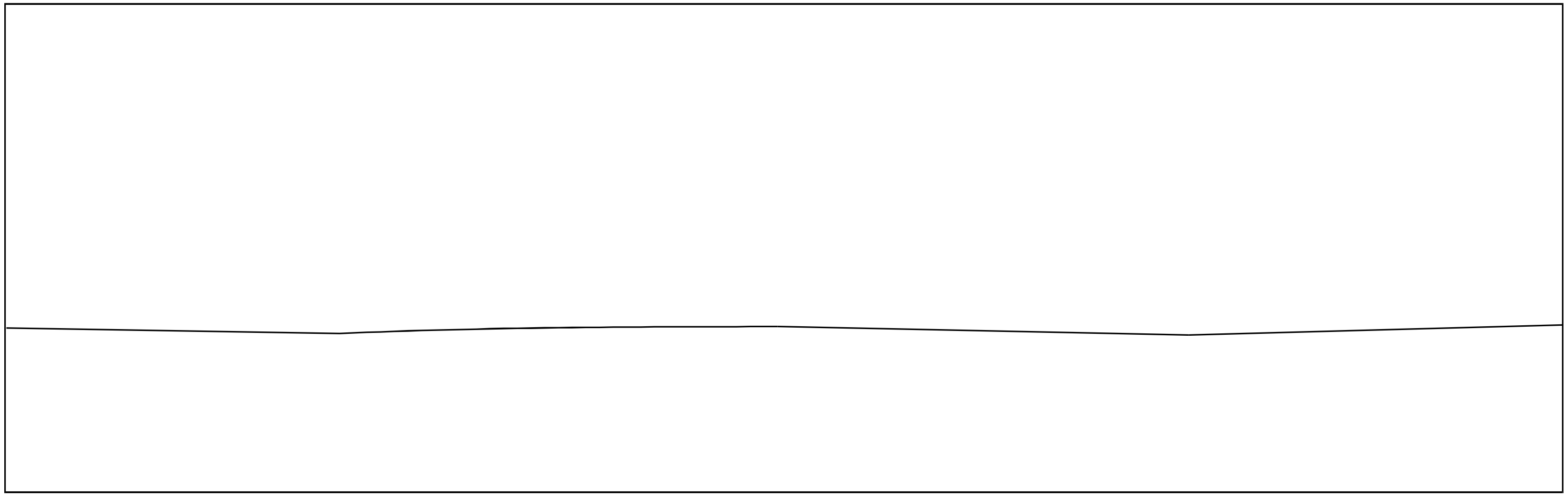
Land-Unit 5e lies to the east of the main road and north of Red Hill. It is an exception within Land-System 5 because there are no dunes, instead it is a flat plain (see Figure 9). The land-unit occupies the site of the former aerodrome and it may be that originally there were dunes or low rises as in Land-Unit 5d and that they were levelled to make the area suitable for aircraft.

In addition to the plants listed in Figure 9, there is considerable establishment of White Clover and Yellow Suckling Clover. Bracken is absent because the soil is not sufficiently acid and because of the relative wetness of the flat plain compared with the dry sites afforded by the dunes in the other land-units.

Yanakie South Land-Zone and its land-systems and land-units have close analogues in the south-western corner of Victoria between Portland and Nelson. This part of the State was included within an extensive survey by Gibbons and Downes (1964) and is described in their volume 'A Study of the Land in South-Western Victoria'. Yanakie South Land-Zone corresponds to their Nelson Land-Zone. Land-System 4 corresponds to their Discovery Bay Land-System. Land-Unit 4a corresponds to Discovery Bay Land-Unit, and Land-Unit 4b to a lesser degree to Baudin Land-Unit. Land-System 5 corresponds to their Nelson Land-System. (Land-Units 5a, 5b, 5d and 5e do not have close analogues to any of the sub-systems and land units of Gibbon & Downes). Land-Unit 5b corresponds to some extent to the Bridgewater sub-system.

2.2 Leonard Bay Land-Zone

Leonard Bay Land-Zone takes in the deep deposits of ‘white’, very acidic sand formed into sand dunes and sand sheets. The sand dunes and sand sheets are used to subdivide the land-zone into Land-Systems 6, 7 and 8, each of which is further divided into land-units.



Landform	Flat plain.
Geology	Deposits of both quartz sand and calcareous sand.
Soil	A mixture of red iron leptopodzol and light yellowish brown calcareous sand.
Native Vegetation	A grassland of native grasses and tussocks of *Isolepis nodosa.* No trees or shrubs.

Figure 9 Land-Unit 5e (Land-System 5)

2.2.1 Land-System 6

Land-System 6 incorporates those areas where the white acidic sands are formed into sand dunes. Both the presence of the dune land-form and the shape and uniformity of size of the sand grains indicate a wind-blown origin of the material.

Humus and iron nomopodzols have developed in the sands and these two soil groups occur throughout the land-system. There is also a very limited occurrence of what is believed to be acidic regosols. These three soil groups are described in Section 2.

There is a widespread and dominant plant community which largely helps to characterise the land-system. It is a treeless, stunted (less than 0.6 metres in height) heath in which a limited number of species are dominant, such as *Allocasuarina pusilla, Leptospermum myrsinoides, L. continentale, B. marginata, Xanthorrhoea australis, Isopogon ceratophyllus* and *Hypolaena fastigiata*. This plant community is confined to and indicative of the nomopodzols.

Land-System 6 occurs in two distinct areas: one between the main road and the Vereker Range, and the other along the west coast from Whisky Bay to Norman Bay. There are differences in land-form and vegetation between these two areas and they are distinguished from each other as Land-Units 6a and 6b.

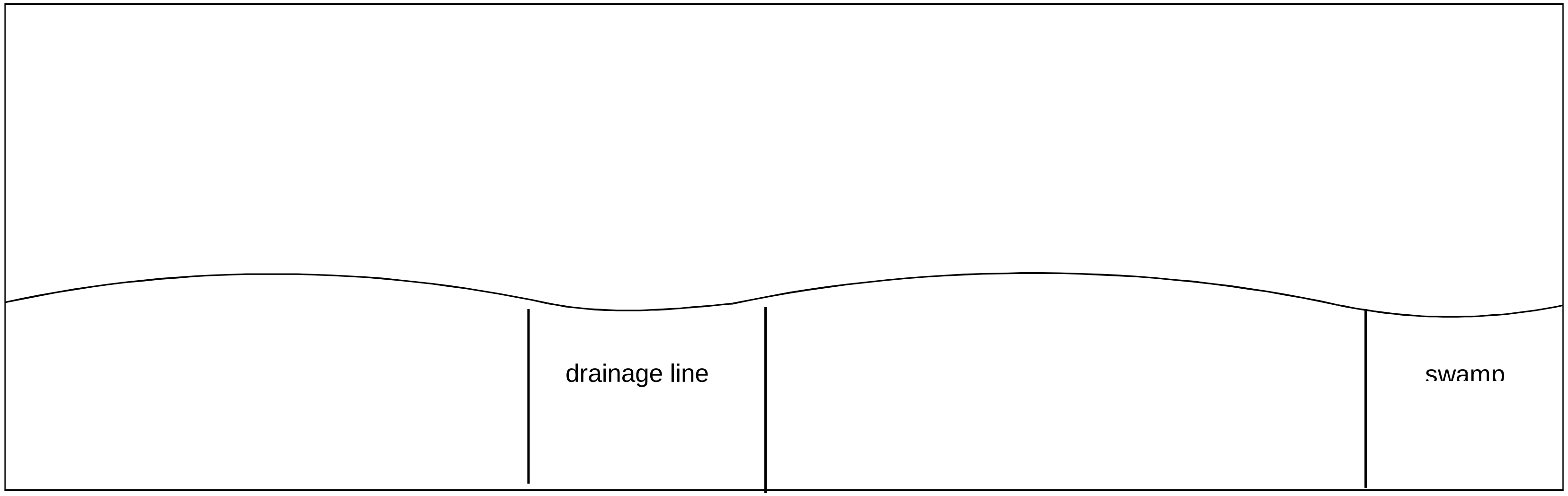
Land-Unit 6a

A summarised description of the land-unit is given in Figure 10. The sand dunes are very low and without sharp ridges, and could be called sand rises. They are not uniformly orientated in one direction but rather their long axes tend to vary in direction. There are a few exceptions to this general description and these are very large dunes which are orientated uniformly in an approximate east-west direction.

This land-unit is found between the main road on the west and the Vereker Range on the east. It differs from Land-Unit 6b in the size and shape of its dunes and in the presence between the dunes of clearly defined drainage lines and swamps with their attendant plant communities. The two largest swamps have been included in Land-System 10.

The land-unit is adjacent to and on the leeward side of Land-Units 5c and 5d of Land-System 5. In this location it is in an analogous position to that occupied by the Follett Land-System of Gibbons and Downes in respect of its position relative to the Nelson and Discovery Bay Land-Systems.

In the southern part of the Yanakie Isthmus, the positions of Land-Systems 4, 5 and 6, with respect to each other, represent what is thought to be a sequence of successively older parent materials and soils. The alkaline, pale yellow regosols in Land-System 4 are believed to be the youngest soils, the terra rossa and rendzinas in Land-System 5 are older, while the red iron leptopodzols in Land-System 6 are believed to be the oldest. This sequence is the same in principle as the one described for the south-western corner of Victoria by Gibbons and Downes. These authors believe that the sequence is the result of successive periods of wind-stripping and re-sorting of soils off the limestone dunes, probably at widely different times, and that the resulting sand deposits have been subjected to varying degrees of podzolisation under different climatic regimes and during different periods of time.



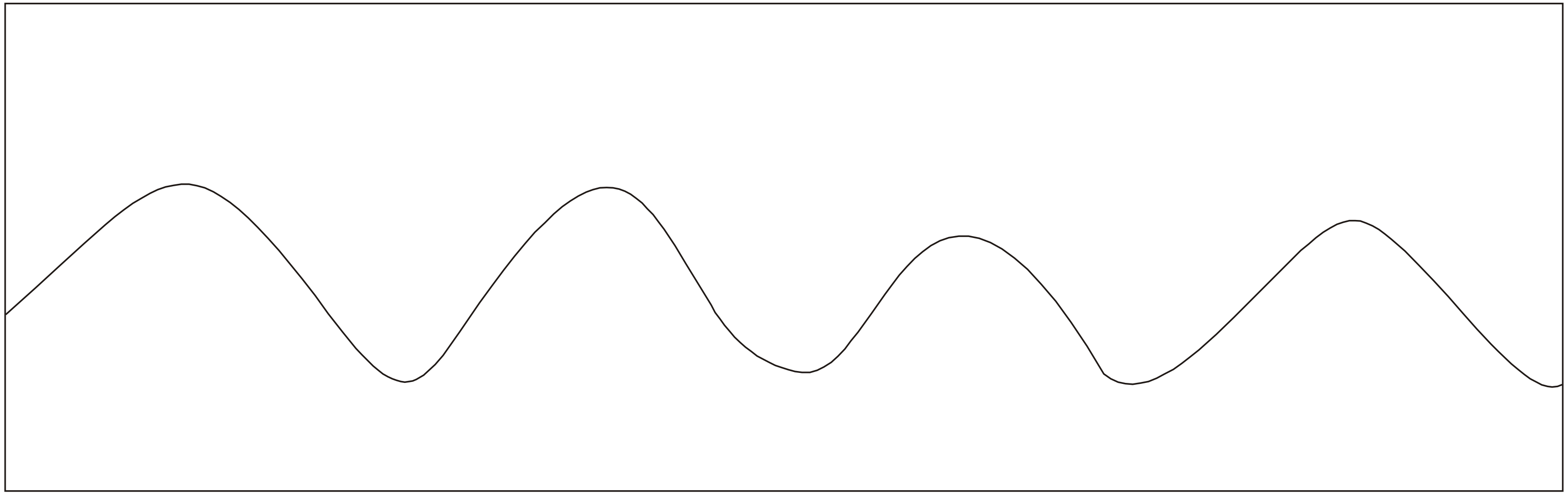
Landform	Mostly low sand dunes or sand rises up to about 4.5 metres in height but mostly less than 3 metres. There are a few large dunes that have more of an affinity with Land-Unit 6b.			
Geology	Wind blown deposits of acidic, “white” quartz sand.			
Soil	Humus and iron nomopodzols			
Native Vegetation	Stunted heath of mainly *Allocasuarina pusilla, Leptospermum continentale, L. myrsinoides, Banksia marginata, Xanthorrhoea australis*, *Epacris impressa, Isopogon ceratophyllus*. There are a few scattered stands of *B. serrata.*	Scrub of short *E. obliqua* and *E. willisii* with tall understorey of *Melaleuca spp.*, *L. continentale, Acacia verticillata*	Species listed as per previous sand dune site.	Free water; wet heath at water edge dominated by *Melaleuca spp*.

Figure 10 Land-Unit 6a (Land-System 6)

Land-Unit 6b

This land-unit is found along the west coast from Whisky Bay to Norman Bay. A summarised description and diagram is given in Figure 11. Mostly the sand dunes are large (many metres in length and up to about 15 metres in height) and many of them lie directly over granite. The position of the dunes inland, with respect to the beaches and their orientation at right angles to the beaches, supports the conclusion that the sand has been blown inland away from the beaches to its recent position. The soil groups occurring in the land-unit are described in Section 2 where the relationships of the humus and iron nomopodzols and acidic regosols to each other are described.

The part of the land-unit adjacent to the Tidal River camping ground is somewhat different from the rest of the land-unit in that (i) there is one long dune sub-parallel to the beach instead of at right angles, (ii) all the other dunes in the area, which are at right angles to the beach, are very much smaller than the dunes elsewhere in the land-unit that are associated with Squeaky Beach, Picnic Point and Whisky Bay, and (iii) the sand dunes do not lie over the granite but are built up on the floor of the Tidal River Valley.



Landform	Sand dunes at right angles to the beach, most are large and massive and overlie granite
Geology	Wind - blown deposits of acidic “white” quartz sand
Soil	Mostly iron nomopodzols, also acidic regosol and humus nomopodzol
Native Vegetation	Facing the beach and for a short distance inland, there is a dry scrub dominated by *Leptospermum laevigatum*, also with *Allocasuarina stricta*, *Leucopogon parviflorus* and *Acacia sophorae* in some localities. Further inland, there are no shrub species but a stunted (less than 60 cm high) heath composed mainley of *Casuarina pusilla*, *Leptospermum myrsinoides*, *Leptospermum continentale*, *Xanthorrhoea australis*, *Banksia marginata*, *Isopogon ceratophyllus, Epacris impressa, Correa reflexa, Hypolaena fastigiata, Lepidosperma spp.*

Figure 11 Land-Unit 6b (Land-System 6)

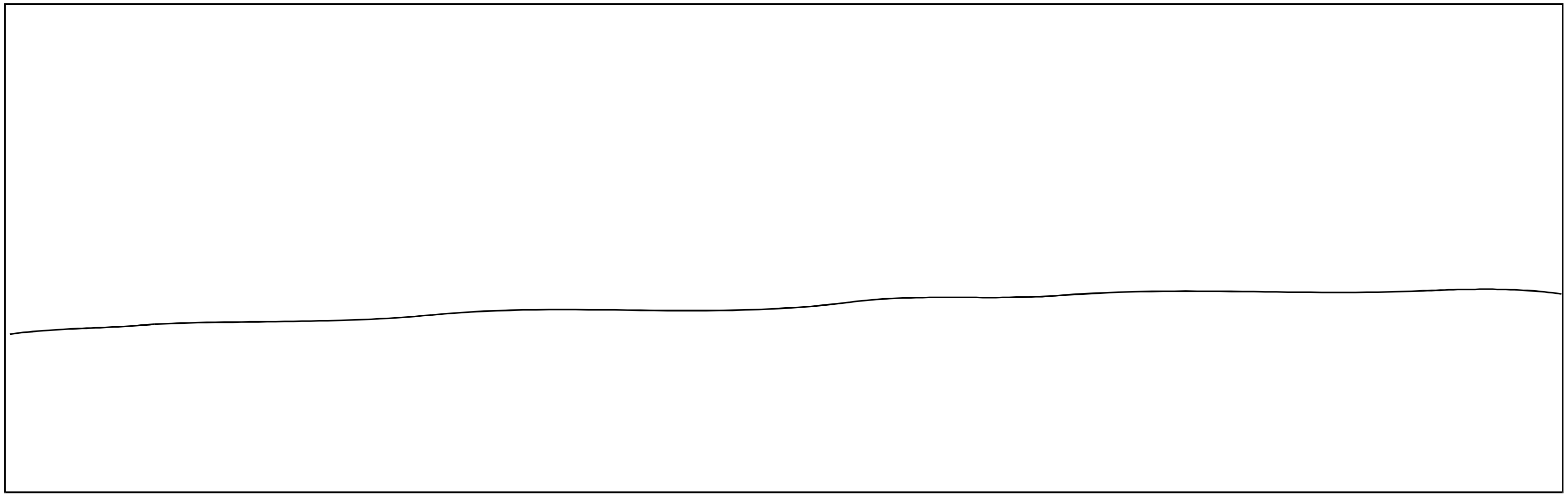
2.2.2 Land-System 7

Land-System 7 incorporates those areas where the white acidic sands have been deposited as flat (or nearly flat) sheets without the formation of dunes. Humus and iron nomopodzols have developed in the sands and these two soil groups occur throughout the land-system.

The land-system occurs as a number of individual areas lying across the northern part of the Promontory. The largest of these differs to some extent from the rest and is designated as Land-Unit 7a. The other areas are collectively called Land-Unit 7b.

Land-Unit 7a

This land-unit lies below Vereker Range on the western side. The land surface has a very gentle and gradual upward slope towards Vereker Range in addition to slight local undulations. It is separated from Land-Unit 6a by the presence of sand dunes, and from Land-Unit 8c by a difference in slope and a lack of entrenched creeks. Environmental features are summarised in Figure 12.



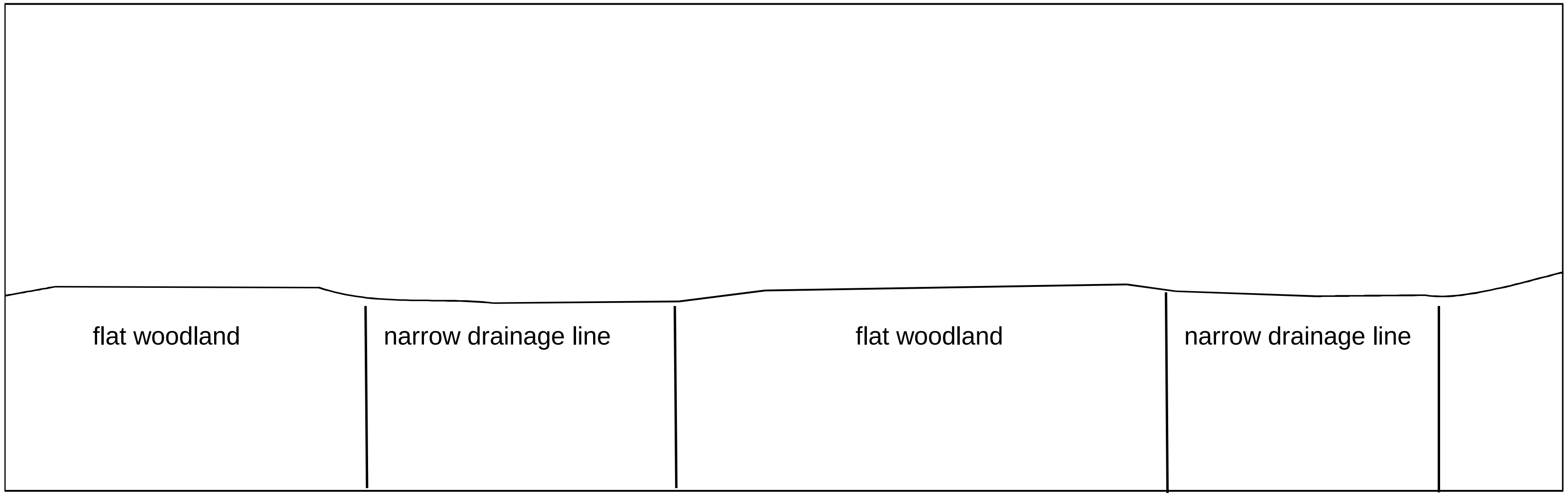
Landform	Flat sand sheet
Geology	Deposits of acidic ‘white’ quartz sand
Soil	Humus nomopodzols
Native Vegetation	A short (less than one metre in height) heath mainly composed of *Allocasuarina pusilla*, *Xanthorrhoea australis, X. minor, Banksia marginata*, *Leptospermum myrsinoides*. A few isolated trees of *B. serrata.*

Figure 12   Land-Unit 7a (Land-System 7)

Land-Unit 7b

Land-Unit 7b has scarcely been studied on the ground so that the nature of its soils, and to a lesser degree of its vegetation, have been summarised from photo-interpretation.

The land-unit consists essentially of flat areas of *Banksia serrata* woodland intersected by narrow drainage lines supporting wet heaths. Environmental features are summarised in Figure 13.



Landform	Flat sand sheets with slight differences in levels				
Geology	Deposits of acidic "white" quartz sand				
Soil	Probably iron nomopodzols	Probably humus nomopodzols and/or peaty soil groups	As in first column	As in second column	As in first column
Native Vegetation	Woodlands of *Banksia serrata*				

Figure 13 Land-Unit 7b (Land-System 7)

2.2.3 Land-System 8

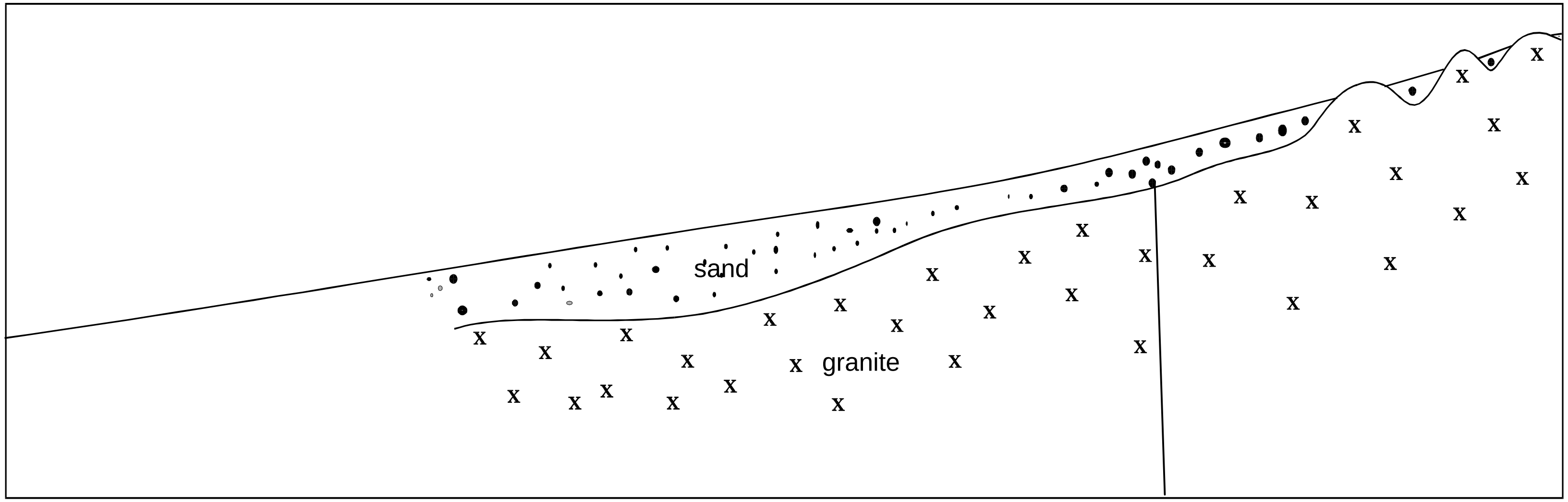
Like Land-Systems 6 and 7, this land-system is of built up deposits of white acidic sands in which nomopodzols have developed. Also, like Land-Systems 6 and 7, there are two dominant and widespread plant communities that can be regarded as more or less reliable indicators of the nomopodzols. These communities are a stunted (less than 0.5 metres high) treeless heath of species listed previously under Land-System 6, and woodland of *B. serrata* with *X. australis,* a dominant member of the heath ground flora.

Land-System 8 differs from the previous two land-systems mainly in the lack of sand dunes and in the fact that the sand sheets are sloping against the sides of granite hills and mountains. It is divided into Land-Units 8a, 8b and 8c as follows.

Land-Unit 8a

This land-unit occurs as a number of scattered areas located mainly on northerly and westerly slopes facing Darby River and in the Picnic Point/Pillar Point/Tidal River area. The environmental features are sand sheets overlying the lower slopes of granite hills and mountains, and some woodlands, such as Pillar Point, that are covered, in the main, by sand sheets with rocky knolls and protruding slopes.

It is believed the sand deposits were blown to their present position by wind rather than coming directly from the granite hills as alluvial hillwash. The evidence of this is found in the small size of the sand grains, in the uniformity of size with a consequent narrow area of size variation, in the spherical to sub-spherical shape of the grains, and in the absence of plate-like grains of mica. These four properties are the opposite to soils formed on granite and in material of granitic origin. Further evidence is the clearly defined boundary, or discontinuity, between the sand deposits and the underlying amply weathered granite, an example of which is to be seen at the entrance to the gravel quarry on the road to Oberon Saddle car park. The *B.serrata* heath woodland is restricted to the areas north of the Darby Saddle where there are areas of treeless heath.



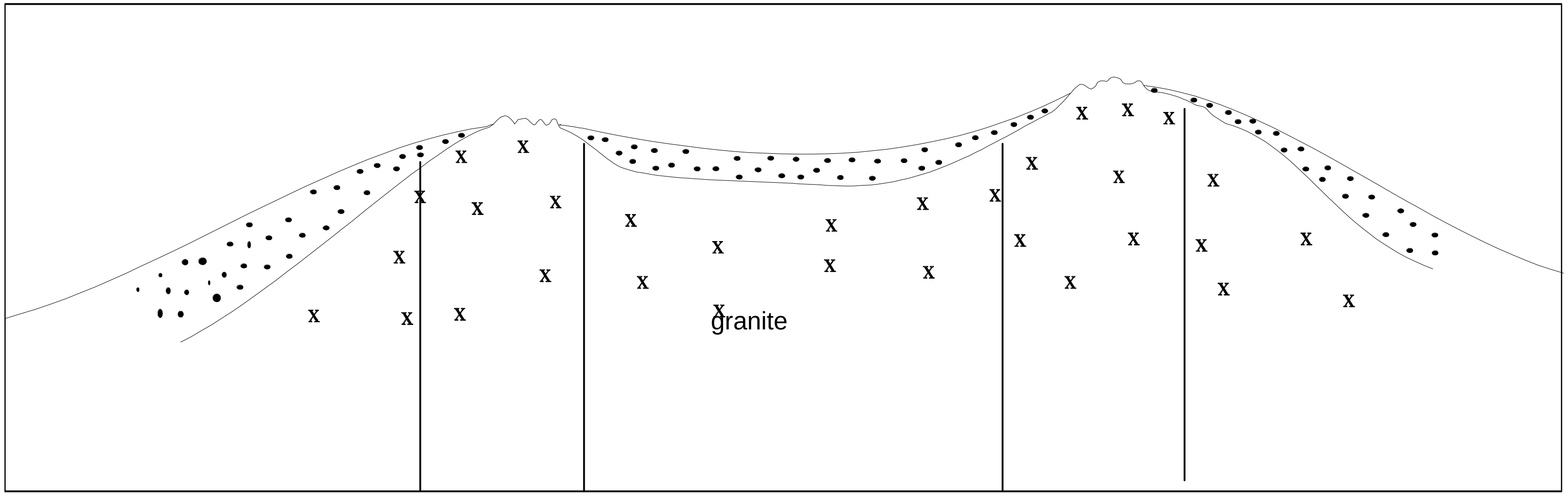
Landform	Sloping sand sheet	Lower slope of granite hill or mountain in Land-System 1
Geology	Wind-blown deposits of acidic “white” quartz sand	
Soil	Iron and humus nomopodzols	
Native Vegetation	Two communities: 1. Stunted heath composed mainly of *Allocasuarina pusilla, Banksia marginata, Leptospermum myrsinoides, L. juniperinum, Correa reflexa, Xanthorrhoea australis, X. minor, Isopogon ceratophyllus, Hypolaena fastigiata.* 2. Heath woodland of *B. serrata* with a heath ground flora of the above species, of which *Allocasuarina pusilla* and *X. australis* are dominant.	

Figure 14 Land Unit 8A of Land-System 8

Land-Unit 8b

Land-Unit 8b differs from the previous land-unit in that the sloping sand sheets surround and almost cover low granite hills. The highest parts of the hills appear as rocky knolls and prominences (see Figure 15). Again, it is thought that the sand deposits are wind-blown because the physical and chemical properties of the sand grains are very similar to those of the sand grains in Land-Unit 8a. A minor and less important difference between the two land-units is that a heath woodland of *B. serrata* (dominant) and *E. obliqua* (sub-dominant) is widespread throughout Land-Unit 8b. This plant community is confined to and indicative of the nomopodzols. There are also areas of treeless heaths which are mainly wet heaths confined to drainage lines between the granite outcrops.

Land-Unit 8b occurs as a number of separate areas across the northern part of the Promontory, and a good example can be found around and beyond the first gate across the road to Five Mile Beach.



<table>
<tr><td>Landform</td><td colspan="7">Sloping sand sheets with protruding rocky knolls</td></tr>
<tr><td>Geology</td><td>Acidic “white” quartz sand, probably wind-blown</td><td>Granite</td><td colspan="3">Sand</td><td>Granite</td><td>Sand</td></tr>
<tr><td>Soil</td><td>Iron nomopodzol</td><td>Duplex</td><td colspan="3">Iron nomopodzol, humus nomopodzol in drainage line</td><td>Duplex</td><td>Iron nomopodzol</td></tr>
<tr><td>Native Vegetation</td><td>Heath woodland of B. serrata and E. obliqua, with a heath ground flora composed mainly of X australis, X. minor, Leptospermum myrsinoides, Epacris impressa, Pteridium esculentum, Allocasuarina pusilla.</td><td>Dry scrub</td><td></td><td>Heath drainage line</td><td></td><td>Dry scrub dominated by E. obliqua and E. baxteri</td><td></td></tr>
</table>

Figure 15 ***Land-Unit 8b (Land-System 8)***

Land-Unit 8c

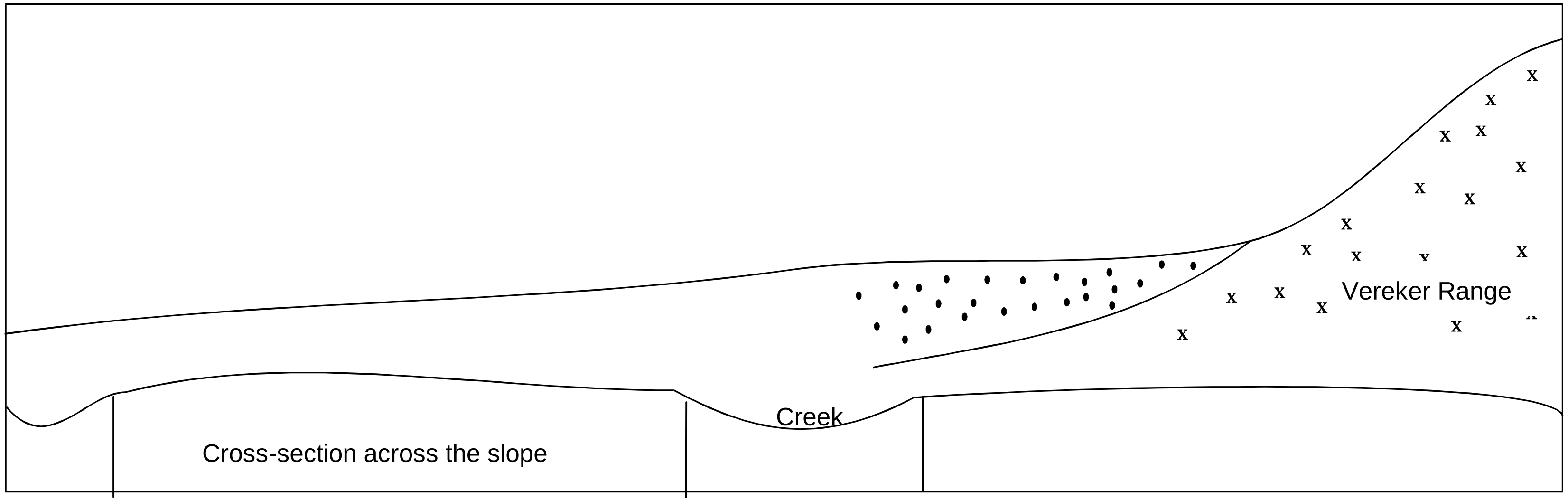
Land-Unit 8c takes in the lowermost slopes of Vereker Range on both sides, to the east and west. Environmental features are summarised in Figure 16, although more time is needed to study the land-unit in greater detail.

The land-unit differs from Land-Unit 8a in at least two features. Firstly, the sloping sheets of sand are deeply dissected by several creeks to form an undulating topography across the slope, and secondly, there is greater movement of surface and sub-surface water down the slope as indicated by numerous seepage lines, the dominance of heath species (e.g. *Melaleuca squarrosa*), favouring wetter sites and the deeper and darker A1 soil horizons formed of higher amounts of organic matter.

The creek channels are narrow and deep, and support a dry sclerophyll forest of eucalypts, mainly *E. obliqua*.

More research is needed on the soils of the slopes. Only one profile was studied and this showed a soil with physical properties different to those of the iron and humus nomopodzols in Land-Units 8a and 8b and in Land-Systems 6 and 7. That is, the sand grains are more angular and have a greater range of sizes, and the A horizon is underlain by a clayey sand to sandy clay material which could be a separate deposit. This latter feature is not found in the sand deposits in which the nomopodzols have formed because in these the A horizon is underlain by an equally sandy B horizon formed of the same material, which extends to a considerable depth (greater than 30 metres). For these reasons, it is believed the sand sheets in Land-Unit 8c could be formed of material from the Vereker Range under the action of water rather than of material blown in from a more distant source by the wind.

The comparatively wet sites afforded by the sloping sand sheets may be a result of the relatively impervious clayey subsoil, if this material does occur throughout the land-unit. The wetter sites have given rise to a number of treeless heath communities dominated by some moisture-tolerant species such as *Melaleuca squarrosa*. *Allocasuarina pusilla*, which is dominant in the drier heath communities of the other land-units and of Land-Systems 6 and 7, is a minor species or is absent in this land-unit.



Landform		Sloping sand sheet		Sloping sand sheet
Geology		Acidic "white" quartz sand overlying probably clay material		As in column 1
Soil		Probably regosols and or podsolised duplex soils.		
Native Vegetation		Mostly a short heath with moisture tolerant dominants such as *Melaleuca squarrosa*. Also scattered stands of *Banksia serrata*.	Short dry sclerophyll forests *E. obliqua*	

Figure 16 Land-Unit 8c (Land-System 8)

2.3 Chinaman's Creek Land-Zone

2.3.1 Land-System 9

Chinaman's Creek Land-Zone incorporates into one mapping unit (Land-System 9) all the larger of the low-lying wet areas found within the National Park. There is a number of very small areas of this kind included as land-components within some of the land-units in Yanakie South and Leonard Bay Land-Zones.

Included within the wet areas are narrow drainage lines, swamps and broad wet heaths. The drainage lines and wet heaths are covered with a dense heath vegetation of wet-tolerant species such as *Melaleucas*.

The soils of the drainage lines, wet heaths and swamp margins are high in organic matter and many of them are probably peats. Parsons (1966), in his intensive study of the ecology of the Tidal River area recognised four groups of soils with high levels of organic matter namely sandy peats, amorphous peats, fibrous peats and salty soils on the tidal flats. These are briefly described in Section 3.1.2.

No time was devoted to the wet areas during the field work and a considerable amount of study is needed to describe them in detail. In the absence of such a close study, the land-zone was assumed to have one land-system (Land-System 9), however it may be that further land-systems could be recognised in any future work. Also, any recognition of variations within the land-systems would allow land-units to be described and delineated.

3 DESCRIPTION OF THE SOIL GROUPS RECOGNISED

3.1 Soils of the Deep Sand Deposits

3.1.1 Soils associated with alkaline sand

(i) Regosol

The regosols show very little differentiation into horizons. There are only slight and gradual changes in their morphological and analytical features down the profile. The main variations that do occur are in the amount and depth of accumulation of organic matter in the surface soil, with consequent small variations in colour and texture from place to place. The accumulation of organic matter depends on the presence and stability of a vegetative cover.

The soil material consists of loose, non-structured sand composed mainly of finely broken sea-shells (60-70 per cent), with quartz grains (40-30 percent.). The sand is alkaline with pH values of 8 and 9. The characteristic colour when dry is 'pale yellow'.

A typical profile is given, described on the fore-dune at Tidal River where there is a stable dry scrub of *Leptospermum laevigatum, Allocasuarina verticillata* and *Leucopogon parviflorus.*

0-90 cm	dark greyish brown (10 YR 3/2 moist) sand; single grain; loose; organic matter present; pH 8.1
90-120 cm	light brown (10 YR 5/3 moist) sand; single grain; loose; organic matter absent
120-150 cm	light yellowish brown (10 YR 6/4 moist) sand; single grain; loose; pH 8.7the third horizon continues for metres and typifies the soil group.

The regosols are found mostly on large calcareous sand dunes, which are mapped as Land-System 4. The calcareous sand of which the regosols are composed also underlies much of the area of 'red' iron leptopodzol included in Land-System 5.

(ii) Terra rossa and rendzina

These two soil groups have similar properties. Essentially, terra rossas are 'red' soils formed on dune limestone, and rendzinas are dark brown to black soils formed on dune limestone. This difference in colour is usually the biggest and most consistent difference. Other morphological features and the analytical features are generally quite similar.

In many sites, the soil is shallow (less that 0.5 metres) and abruptly overlies the dune limestone. Pieces of broken limestone may lie in the soil. Rendzinas in some sites are comparatively deep, up to 1.5 metres. Both soils are composed of a mixture of broken sea-shells and quartz grains, although there is more quartz than sea-shells, and they are slightly alkaline to moderately alkaline. There is little change in the soil features down the profile.

A typical rendzina profile is given, described on a dune of dune limestone where there is a dry scrub of *Banksia integrifolia, Leptospermum laevigatum, Leucopogon parviflorus, Acacia longifolia, Allocasuarina verticillata.*

0-15 cm dark brown (7.5 YR 3/2 moist) sand; very friable; weak structure; pH 7.2

15-45 cm dark brown (7.5 YR 3/2 moist) sand; loose; single grain; pieces of broken limestone gradually changing to massive dune limestone

A typical terra rossa profile is given, described on a dune of dune limestone where there is a woodland of *Banksia integrifolia*

0-15 cm brownish red (5 YR 4/6 moist) sand; weak structure; very friable; pH 8.2; pieces of broken limestone

15^+ cm dune limestone

The dunes on which the terra rossas and rendzinas occur are included in Land-System 5 which lies in the area bounded on the south by Darby River, on the east by the main road, on the north by Cotter Lake and on the west by the sand dunes along the coast.

(iii) Iron leptopodzol

Leptopodzols are included in the podzol group of soils, although they have not been influenced by the podzolising processes to the same extreme degree as the typical or normal podzols (later referred to as nomopodzols). Thus the A2 horizon is not bleached but has a definite colour, and there is no sudden change to a brown or yellow B horizon.

Like the terra rossas, the iron leptopodzols at Wilson's Promontory are 'red' sands, but are deeper, composed solely of quartz grains and are slightly acid to neutral (pH 6.6 - 7.0). They have not formed directly on dune limestone but in deposits of windblown sand that are believed to have originated from the limestone dunes. The upper few centimetres are darkened by organic matter and the reddest soil is found in the subsurface below about 30 centimetres. At most sites, the 'red' sand overlies a light yellowish brown calcareous sand composed of a material closely similar in composition to that of the regosol described above. The depth of the 'red' sand varies from about 45 to 90 centimetres.

A typical profile is given below, described on the side of a sand dune on the main road, 650 metres south of the start of the Five Mile Road. The vegetation is a woodland of *Banksia integrifolia* with a ground flora dominated by dense bracken.

0-5 cm dark brown (7.5 YR 4/2 moist) loamy sand; moderate structure; very friable; organic matter present

5-20 cm brown (7.5 YR 5/4 moist) sand; single grain; very friable; organic matter present

20-45 cm reddish brown (5 YR 4/4 moist) sand; single grain; loose; organic matter absent; pH 7.0

45-90 cm yellowish red (5 YR 4/8 to 5/8 moist) sand; single grain; loose

90-150 cm strong brown (7.5 YR 5/6 moist) sand; single grain; loose; gradually becoming light yellowish brown (10 YR 5/6 moist) sand; pH 8.5

The iron leptopodzols occur in Land-Systems 5 and are represented well in Land-Unit 5c.

3.1.2 Soils associated with acidic sand

(i) Nomopodzol

The nomopodzols within the National Park are highly podzolised soils formed in deep deposits (more than 3.0 metres) of quartz sand. They show marked profile development with clearly defined A and B horizons. The A horizon is usually between 0.75 metres and 1.8 metres in depth and is bleached to 'white' or very light grey except for the accumulation of organic matter at the surface which forms a thin dark grey A1 horizon. There is a sudden change to a B horizon of yellow, yellowish brown and brown sand. This boundary is usually very irregular with tongues of A horizon penetrating many centimetres into the B horizon. The nomopodzols are moderately to highly acidic (pH 5.9 - 4.0).

These soils are subdivided into iron nomopodzols and humus nomopodzols. The iron nomopodzols are as described whereas the humus nomopodzols are identified by a uniform zone of dark brown ('coffee') humic sand forming a B1 horizon at the boundary between the A and B horizons. In wetter sites, this dark brown sand is cemented to form a hardpan of coffee rock. Below the B1 horizon, the B2 horizon continues for some depth as a yellowish brown, yellow or brown sand.

The following profile of an iron nomopodzol was described on a sand dune on the edge of the Tidal River camping area on a foot track leading to Oberon Bay. The vegetation is a stunted (less than 0.6 metres high) heath with *Allocasuarina pusilla* and *Banksia marginata* as the dominant species.

A1 0-5 cm grey (10 YR 5/1 moist) sand; weak structure; very friable; organic matter present.

A2 5-75 cm and 120 cm
light grey (10 YR 6/1 moist) sand; cm single grain; loose; organic matter present in small amount; pH 5.3 at 15 - 20 cm gradually becoming white (10 YR 7/1 moist) sand; single grain; loose; organic matter absent.

B1 75 cm and 120-150 cm
yellowish brown (10 YR 5/4 moist) sand; single grain; loose; pH 5.6. The sand continues for metres.

The nomopodzols occur in Land-Systems 6, 7 and 8, which together form the Leonard Bay Land-Zone. The nomopodzols in the dunes of Land-Unit 6A form a sequence of soil and parent material with the regosols, terra rossas, rendzinas and iron leptopodzols associated with the calcareous sand and dune limestone in Land-Systems 4 and 5. This sequence is very similar to the one in the south-west corner of Victoria, between Portland and Nelson, which is described by Gibbons and Downes in their book *A Study of the Land in South-Western Victoria.*

(ii) Regosol

It is not certain whether the soils described as acidic regosols are actually regosols or an unusual form of humus nomopodzol, or whether in fact both soils exist.

The soils in question are found in very large sand dunes around Squeaky Beach, Picnic Point and Whisky Bay. Many of these dunes are formed of what appears to be a uniform, undifferentiated quartz sand which is regarded as a regosol. The sand is both white (10 YR 8/2 moist), as at Squeaky Beach, and cream (10 YR 6/3 moist), as at Picnic Point. However, also at Picnic Point there is exposed in two badly eroded dunes a massive zone of 'coffee rock' about one metre thick and at considerable depth within the dunes. The sand above and below the coffee rock is identical to the regosol sand of the other dunes in the area. The presence of the coffee rock indicates that the material composing the dunes has been podzolised. Apart from deep boring, the only way of detecting the coffee rock is to observe it exposed deep within the dunes in large wind-excavated 'blow-outs.' There are several dunes damaged in this way but no zone of coffee rock is visible and so the soil is regarded as a regasol.

(iii) Soils high in organic matter

No time was spent in studying the soils of the swamps and drainage lines, however it is thought that they can be conveniently grouped together under the above heading. In his study of the ecology of the Tidal River area, Parsons (1966) recognised four groups of soils with high levels of organic matter. The first group contains peaty sands and sandy peats, which are made up of partly decomposed amorphous remains of *Melaleuca* species and a clearly visible sand content. The second group contains amorphous peats, which are similar to the first group but are higher in organic matter and have no visible sand content. The third group contains fibrous peats, which are composed of sedge residues, and the fourth group contains organic soils on the tidal flats and these consist of sandy peat with some fibrous material.

3.2 Soils Formed on Granite

Little time was spent in the granite areas and only the following two soil groups to follow were described. There are probably other groups as well.

(i) Podzolised duplex soil

The term 'duplex' refers to the dual, or double nature, of the profile, namely, a comparatively shallow A horizon of sandy material abruptly overlying a subsoil of clay. The term 'podzolised' refers to the podzolised A horizon which, in the deeper examples, is accompanied by a thin zone of 'coffee brown' humus deposit at the boundary between the A and B horizons. The shallower A horizons (around 30 centimetres in depth) do not have the humus deposit. The A horizon has large amounts of angular quartz stones and gravel, and also it is divided into a dark grey A1 horizon of organic matter accumulation and a light grey A2 horizon. The clay subsoil has colours of yellowish brown, brown, greyish brown and red, and is gravelly with quartz stones. The entire profile is highly acidic (pH 4.0-5.5).

The following profile was described at the car park at Oberon Saddle. There is a dry scrub of *E. baxteri* and *E. willisii , Xanthorrhoea australis, Leptospermum myrsinoides, L. continentale* and *Banksia marginata.*

A1	0-10 cm	dark grey gravelly loamy sand; weak structure; friable; small stones of quartz
A2	10-45 cm	light brownish grey (10 YR 5/2-6/2 moist) gravelly sand; single grain; soft; small stones of quartz pH 4.4
B1	45-50 cm	dark brown (7.5 YR 3/2 moist) gravelly sand; single grain; loose; small stones of quartz
B2	50-80 cm	strong brown (7.5 YR 5/6 and 5/8 moist) clayey gravelly sand; cemented and structureless; hard

B3 80-120 cm mottles of yellowish brown, brown and red gravelly clay; friable; pH 4.2

(ii) Acid brown earth

No profile of this group was formally described. The most evident feature of the soils in this group is the strong brown colour throughout most of the profile. Also, these soils have more clay and less sand than the podzolised duplex soils and there is a gradual increase in clay content with depth rather than a sudden and large increase. The subsoil is a strong brown clay.

APPENDIX 1

Comparison of the Australian Soil Classification, 1996 (Isbell) with the existing soil classification (based on the scheme of Hallsworth, Costin and Gibbons (1953)).

Classified by Sibley based on Hallsworth, Costin & Gibbons.	Australian Soil Classification (Isbell)
A. SOILS OF THE DEEP SAND DEPOSITS	
1. Soils associated with alkaline sand	
(i) Regosols, as described	Rudosol: Shelly family criteria: E, K and/or Tenosol: Chernic-Leptic, Shelly, Melanic family criteria: D, E, K, K, X
(ii) Terra rossa, as described	Calcarosol: Calcic, Petrocalcic, Ceteric family criteria: B, E, K, K, T
and Rendzina, as described	Calcarosol: Calcic, Petrocalcic, Ceteric family criteria: B. E, K, K, U
(iii) Iron leptopodzol, as described	Tenosol: Orthic, Regolithic, Basic family criteria: A, E, K, K, W
2. Soils associated with acidic sand	
(i) Nomopodzol - iron, as described	Tenosol: Bleached-Orthic, Regolithic, Acidic family criteria: A, E, K, K, X
and Nomopodzol – humic, not fully described	Podosol: Semiaquic, Pipey, Parapanic family criteria: A, E, K, K, X
(ii) Regosol, not fully described	Rudosol: Arenic, Acidic family criteria: A, E, K, K, X or Podosol: Semiaquic, Humosesquic, Parapanic family criteria: A, E, K, K, X
(iii) Soils high in organic matter, not described	Organosols, Tenosols
B. SOILS FORMED ON GRANITE	
(i) Podzolised duplex soils, as described	Podosol: Semiaquic, Humic, Parapanic family criteria: B, G, K, M, W or Kurosol: Brown, ?, Bleached-Mottled family criteria: B, G, K, M, W
(ii) Acid brown earth not described	Dermosols: Brown

This comparison is based on existing information in the Wilson's Promontory report by Sibley with no soil chemical information apart form pH (water) values. Alternatives are given where there is some doubt as to the diagnostic criteria which may vary within a map unit. The use of the term podzol or podzolised has been more tightly defined in the Australian Soil Classification and hence the classification into other orders besides podosols, particularly tenosols.

The concepts and terms discussed in this report are based on those of Hallsworth, Costin and Gibbons (1953), which are based on descriptions of soils in New South Wales. The paper cited is the sixth in a series of seven studies of pedogenisis in New South Wales.

APPENDIX 2

Laboratory Data

Profile	Lab no.	Soil Type	Horizon	Gravel (%)	pH(water)	EC(dSm^{-1})
0431	65/1696	Regosol	A11	0	8.1	0.200
0431	65/1697	Regosol	A13	0	8.7	0.220
0432	65/1698	Iron Nomopodzol	A2	0	5.3	0.095
0432	65/1699	Iron Nomopodzol	B1	0	5.6	0.040
0433	65/1700	Iron Nomopodzol	A2	<1	4.5	0.092
0433	65/1701	Iron Nomopodzol	A2	<1	5.2	0.052
0433	65/1702	Iron Nomopodzol	B1	<1	5.7	0.044
0434	65/1703	Podzolized Duplex	A2	14	4.4	0.091
0434	65/1704	Podzolized Duplex	B4	6	4.2	0.190
0435	65/1705	Regosol	A1	0	5.2	0.047
0435	65/1706	Regosol	A2	0	5.0	0.027
0436	65/1707	Rendzina	A1	1	7.2	0.190
0437	65/1708	Red, iron	B	0	7.0	0.110
0437	65/1709	Leptopodzol	2B2	<1	8.5	0.160
0438	65/1710	Terra Rossa	A1	4	8.2	0.260
0439	65/1711	Regosol	A1	0	8.4	0.110
0439	65/1712	Regosol	A2	0	9.0	0.091

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NOTES

The Eucalyptus species identified as *Eucalyptus vitrea* in the original report is now known as *Eucalyptus willisii* (Shining Peppermint). However, it is now thought that this species is actually of a Tasmanian provenance and as such may well be identified in the future as *E. nitida.* (Cameron,[1] pers. comm.).

[1] D. Cameron (Senior Botanist, Biodiversity Directorate, Department of Natural Resources and Environment)

BOTANICAL NAME CHANGES OF WILSON'S PROMONTORY VEGETATION

The following botanic list comprises the names of the native and naturalised vascular plants recognised as occurring in Wilson's Promontory who's names have been altered since this report was first published in 1966. (Ross, 1996).

Was	Now	Future
Acacia sophorae	***Acacia longifolia***	
Bedfordia salicina	***Bedfordia arborescens***	
Casuarina paludosa	***Allocasuarina paludosa***	
Casuarina pusilla	***Allocasuarina pusilla***	
Casuarina stricta	***Allocasuarina verticillata***	
Eucaluptus bicostata	***Eucalyptus globulus***	
Eucaluptus vitrea	***Eucalyptus willisii***	***Eucalyptus nitida***
Hypolaena sp.	***Hypolaena fastigiata***	
Leptospermum juniperinum	***Leptospermum continentale***	
Scirpus nodosus	***Isolepis nodosa***	

As this report was originally published in 1966, all measurements have been converted to metric.