

# VIB Vivonne Bay Land System

Old calcreted dune topography on Kangaroo Island's south coast, stretching from Vivonne Bay to the Kelly Hill Caves. The land system is bordered by the sea to the south and east, by dissected plateau and low-lying drainage depressions to the north and north-west, and by jumbled shell sand dunes to the west. This land system is very similar to the Point Tinline Land System, and is named after and lies to the west of Vivonne Bay: also the Vivonne Bay Conservation Park is situated in this east of the land system.

**Area:** 88.9 km<sup>2</sup>

**Annual rainfall:** 550 - 600 mm average

**Geology:** Most of the area is covered by Pleistocene age Bridgewater Formation calcreted calcarenite. This material covers older sediments. This formation includes the Kelly Hill Caves 'limestone', which is many metres thick. The formation process of this area can be visualised as follows: the land was covered by wind-deposited shell sand dunes; these dunes were subject to leaching, which caused carbonate to accumulate below the surface; the surface sand was then blown off, exposing the layer of enriched carbonate to the elements; then exposure to wetting and drying caused the cap of the enriched carbonate layer to harden into calcrete, giving the present situation of calcrete capped calcarenite on which shallow soils have formed.

A few areas of shell sand dunes occur along the coast: recent deposits of the Gantheaume and Semaphore Sand members of the St. Kilda Formation.

Quaternary alluvial deposits occur in a few depressions.

Middle Cambrian age Stun Sail Boom granite and migmatised Kanmantoo Group meta-sediment are exposed along sections of the coastal cliffs.

**Topography:** Jumbled dune topography, with a few plains and depressions, overlying plains and rises. The dune topography is cut by the Harriet and Stun'sail-Boom rivers. In some depressions areas the calcrete has been 'dissolved', resulting in deeper soils, usually overlying a massive enriched carbonate layer. In the very west of the system, the dune topography covers a low hill, and soils are generally deeper than over the rest of the system. The only significant stand of tall trees is found on the slopes of this hill, around the entrance to the Kelly Hill Caves, where the soils are more fertile than elsewhere in the system, and it is likely that groundwater can be accessed by tree roots through channels in the 'limestone'. Cliffs form the coastline, rising from 10 - 60 m high.

**Elevation:** From sea-level to the highest points of 90 m on the rise at Cape Kersaint, and 100 m on the low hill in the west of the land system.

**Relief:** Typically 10 - 20m

**Main Soils:** **B3-B2** Soil on calcrete

**Minor Soils:** **A1-B1** Shelly soil on calcrete  
**H1** Shell sand  
**B7** Shallow texture contrast soil on calcrete  
**B3-B2** Very shallow organic soil on calcrete  
**C1-A4** Deep to moderate depth loamy to sandy soil  
**G3-G4** Sandy to loamy topsoil on sodic clay



**Main Features:** The land system is mostly non-arable due to shallow rubbly soils. Native scrub covers most of this area. Nature conservation is the main priority here.

**Soil Landscape Unit summary:** Vivonne Bay Land System (VIB)

SLU	% of area	Main features #
JRE	0.5	Non-arable alluvial flat depression. Main soils: sandy to loamy topsoil over sodic clay loam to clay, with abundant carbonate in the subsoil or lower subsoil <b>G3-G4</b> ( <i>Grey Sodosol</i> ). With limited sandy to loamy soil formed on calcrete ( <b>B3</b> ). <b>JRE</b> – depression flat (5w)
M-A M-B M-C	1.3 0.8 0.4	Non-arable sheet calcrete areas. Main soils: mostly not soil, but exposed calcrete outcrop ( <b>RR</b> ). With areas of very shallow, dark and organic loamy to sandy soil on calcrete <b>B3-B2</b> ( <i>Petrocalcic Rudosol</i> ). <b>M-A</b> – gently undulating area <b>M-B</b> – slopes (3-10%, 2e) <b>M-C</b> – slopes (10-20%, 3e)
MqB MqE Mqq	0.9 1.8 0.9	Semi-arable old calcreted areas: with shallow soils and some deeper soils. Main soils: shallow soil over calcrete or calcrete rubble <b>B7-B3</b> ( <i>Petrocalcic Sodosol-Tenosol</i> ). With deeper soils, where calcrete has been dissolved <b>G3-C1</b> ( <i>Sodosols and Tenosols</i> ). <b>MqB</b> – sloping swale areas (1-3%, 2-1e, 2°s) <b>MqE</b> – gently undulating depression/plain area (2°s, 4w) <b>Mqq</b> – gently undulating depression/plain area (3-2°s, 4w)
MpA MpYA	1.8 0.8	Non-arable old calcreted areas: with shallow texture contrast soils. Main soils: shallow sandy to loamy topsoil over a sodic clay loamy subsoil over calcrete or calcrete rubble; with shallow sandy to loamy soils on calcrete: <b>B7</b> with <b>B3</b> ( <i>Petrocalcic Sodosol-Tenosol</i> ). Minor areas of deeper texture contrast soil with sodic clay subsoil <b>G3-G4</b> ( <i>Brown Sodosol</i> ). <b>MpA</b> – gently undulating plain <b>MpYA</b> – mostly old low jumbled dunes/rises (<5m)
MgA MgB MgC MgE MgF MgYA MgYB	1.4 1.3 0.8 7.3 0.1 1.2 31.8	Non-arable old calcreted areas: with shallow soils. Main soils: shallow loamy to sandy soil on calcrete <b>B3-B2</b> ( <i>Petrocalcic Tenosol-Calcarosol</i> ). Minor to limited areas of shallow texture contrast soil with sodic clay loamy subsoil on calcrete ( <b>B7</b> ). Minor to limited areas of shallow to moderate depth shell sand soil ( <b>B1-A1</b> ). Minor to limited areas of moderate depth sandy soil ( <b>H2-H3</b> ). <b>MgA</b> – gently undulating plain <b>MgB</b> – slopes (2-4%, 2e) <b>MgC</b> – slopes (3-8%, 3e) <b>MgE</b> – depression/swale area <b>MgF</b> – slopes (30-50%, 6e) <b>MgYA</b> – mostly low old jumbled dunes (<5m) <b>MgYB</b> – mostly old jumbled dunes (5-15m)
MkD MkYB	0.8 1.7	Non-arable old calcreted areas: with red soils on calcrete, and some ironstone soils. Main soils: shallow to moderate depth red loamy soil on calcrete <b>B3-B2-C1-A4</b> ( <i>Red Petrocalcic Tenosol-Calcarosol</i> ). With loamy to sandy ironstone soils with yellow-brown clayey subsoil <b>J2</b> ( <i>Brown Ferric-Petroferric Chromosol-Sodosol</i> ). Other soils on calcrete occur: shallow to moderate depth grey or brown sandy to loamy soil on calcrete <b>B3-B2-C1-A4</b> ( <i>Petrocalcic Tenosol-Calcarosol</i> ). <b>MkD</b> – slopes (8-15%, 4-3e) <b>MkYB</b> – old dune topography (5-15m)
MjYA MjYB MjYE	1.9 1.3 1.2	Non-arable old calcreted areas: with moderate to shallow depth soils. Main soils: shallow to moderate depth sandy to loamy soil on calcrete <b>B3-B2-C1-A4</b> ( <i>Petrocalcic Tenosol-Calcarosol</i> ). And shallow to moderate depth shelly sandy to loamy soils on calcrete <b>A1-B1</b> ( <i>Petrocalcic Shelly Calcarosol</i> ). <b>MjYA</b> – mostly old low jumbled dunes (<5m) <b>MjYB</b> – mostly old jumbled dunes (5-15m) <b>MjYE</b> – mostly old jumbled dunes, on hill slope (5-15m)



MbC	0.3	Non-arable calcreted areas: with moderate to shallow depth shelly soils.
MbD	0.1	Main soils: moderate to shallow depth shelly sandy to loamy soil <b>A1-B1</b> ( <i>Petrocalcic Shelly Calcarosol</i> ).
MbE	0.2	Often with some shallow sandy to loamy soil on calcrete <b>B2-B3</b> ( <i>Petrocalcic Calcarosol-Tenosol</i> ); and
MbF	0.05	some deeper shell sands on low dunes <b>H1</b> ( <i>Shelly Calcarosol-Rudosol</i> ).
MbYA	1.0	<b>MbC</b> – slopes (3-10%, 3e)
MbYB	0.5	<b>MbD</b> – slopes (10-20%, 4e) <b>MbE</b> – depression area <b>MbF</b> – slopes (20-30%, 5e) <b>MbYA</b> – mostly low jumbled dunes (<5m) <b>MbYB</b> – mostly jumbled dunes (5-15m)
MdB	0.2	Non-arable old calcreted areas: with shallow calcareous soils.
MdYB	1.2	Main soils: shallow calcareous soil on calcrete <b>B2</b> ( <i>Petrocalcic Calcarosol</i> ). Minor to common shallow to moderate depth shell sand soil ( <b>B1-A1</b> ). <b>MdB</b> – slopes (2-5%, 2-3e) <b>MdYB</b> – mostly old jumbled dunes (5-15m)
MaYA	1.1	Non-arable calcreted areas: with shallow shelly soils. Main soils: shallow to very shallow shelly sandy soil <b>B1</b> ( <i>Petrocalcic Shelly Calcarosol</i> ). Possibly with some shallow rubbly sandy to loamy calcareous soil on calcrete <b>B2</b> ( <i>Petrocalcic Calcarosol</i> ). <b>MaYA</b> – mostly low jumbled dunes (<5m)
MeE	1.8	Non-arable depression areas: partially calcreted. Main soils: shallow sandy to loamy soil on calcrete <b>B3-B2</b> ( <i>Petrocalcic Tenosol-Calcarosol</i> ); and deeper sandy to loamy soils, where calcrete has been dissolved <b>C1-A4-G3</b> ( <i>Tenosols-Calcarosols-Sodosols</i> ). Some soils are shelly. <b>MeE</b> – depressions (4-3w)
MiE	0.3	Non-arable old calcreted areas: with moderate to shallow depth soils.
MiYA	0.4	Main soils: shallow to moderate depth sandy to loamy soil on calcrete <b>B3-B2-B7-C1-A4-G3</b>
MiYB	8.9	( <i>Petrocalcic Tenosol-Calcarosol-Sodosol</i> ). With minor to limited shallow to moderate depth shelly
MiYC	0.9	sandy to loamy soils on calcrete <b>B1-A1</b> ( <i>Petrocalcic Shelly Calcarosol</i> ).
MiYE	10.8	<b>MiE</b> – depression
MiYH	5.5	<b>MiYA</b> – mostly old low jumbled dunes (<5m) <b>MiYB</b> – mostly old jumbled dunes (5-15m) <b>MiYC</b> – high old jumbled dunes (>15m) <b>MiYE</b> – mostly old jumbled dunes, on hill slope (5-15m) <b>MiYH</b> – mostly old jumbled dunes, on hill summit (5-15m)
PmO	0.1	Depression with texture contrast soils. Main soils: sandy texture contrast soils, some possibly overlying calcrete <b>G3</b> ( <i>Brown Sodosol</i> ). With some patches of shallow sandy soil on calcrete <b>B2-B8</b> ( <i>Petrocalcic Calcarosol-Tenosol</i> ). <b>PmO</b> – depression with raised subsoil salinity levels.
WAB	2.2	Unconsolidated coastal calcarenite cliffs. Often with rocky (some granite) or calcarenite reef at the base of cliffs. <b>WAB</b> – calcarenite cliffs (>100%)
WBB	1.1	Consolidated coastal cliffs, steep slopes and reefs, usually of granite. Cliffs usually capped by calcarenite. <b>WBB</b> – granite cliffs and steep slopes (>30%)
WGE	2.6	Non-arable coastal shell sand dunes.
WGC	0.3	Main soils: deep shell sand soil <b>H1</b> ( <i>Shelly Calcarosol-Rudosol</i> ). With some shallow to moderate depth
WGQ	0.04	soil on calcrete ( <b>B1-A1</b> ).
WGR	0.2	<b>WGE</b> – mostly low coastal dunes (<5m)
WGe	0.1	<b>WGC</b> – mostly high coastal dunes (>15m) <b>WGQ</b> – depression <b>WGR</b> – depression flat (3s) <b>WGe</b> – bare sandy beach
WT-	0.2	Rocky reefs at base of cliffs. Usually granite.
ZQ-	0.03	Lagoonal depression. Bare; marginal salinity (4-5s?; 7w). Main soils: thin to medium thickness sand over tight grey sodic clay <b>N2</b> ( <i>Grey Sodosol-Hydrosol</i> ).



# Classes in the 'Soil Landscape Unit summary' table (eg. 2-1e, 3w, 2y, etc) describe the predominant soil and land conditions, and their range, found in Soil Landscape Units. The number '1' reflects minimal limitation, while increasing numbers reflect increasing limitation. Letters correspond to the type of attribute:

a - wind erosion	e - water erosion	f - flooding	g - gullying
r - surface rockiness	s - salinity	w - waterlogging	y - exposure

### Detailed soil profile descriptions:

#### Main Soils:

##### **B3-B2** Soil on calcrete (*Petrocalcic Tenosol-Calcarosol*)

Shallow to very shallow, or sometimes moderate depth, loamy to sandy soil on calcrete. Sometimes calcareous throughout; often with a carbonate enriched subsoil layer just above the calcrete; and sometimes with a bleached subsurface layer. Old dunes, plains, rises and depressions. Red coloured variants are found on some old dune topography and slopes.

#### Minor Soils:

##### **A1-B1** Shelly soil on calcrete (*Petrocalcic Shelly Calcarosol*)

Moderate to shallow depth dark grey to grey fine shell sand on calcrete. There is usually a pronounced organic build-up in surface layers; and some leaching of carbonate has occurred. Dunes and depressions.

##### **H1** Shell sand (*Shelly Calcarosol-Rudosol*)

Deep fine shell sand soil: grey or brown over light grey or white. Recent dunes.

##### **B7** Shallow texture contrast soil on calcrete (*Petrocalcic Sodosol*)

Shallow to very shallow, loamy to sandy topsoil, usually with a bleached layer, over brown sodic sandy clay loam to light clay, on calcrete. Found on the oldest remnant dune areas.

##### **B3-B2** Very shallow organic soil on calcrete (*Petrocalcic Rudosol*)

Very shallow, dark and organic rich, rubbly loamy to sandy soil on calcrete. Often calcareous. Found on wind-swept coastline where the land surface is a mosaic of bare calcrete outcrop and calcrete covered by a thin veneer of soil.

##### **C1-A4** Deep to moderate depth loamy to sandy soil (*Tenosol-Calcarosol*)

Loamy to sandy topsoil, sometimes with some hard carbonate fragments, over highly calcareous loamy to sandy subsoil. This carbonate enriched subsoil can sometimes be relatively hard and massive, forming a 'soft' pan. Found in depressions. Red coloured variants overlying calcrete at moderate depth are found on some old dune topography and slopes.

##### **G3-G4** Sandy to loamy topsoil on sodic clay (*Brown-Grey Sodosol*)

Medium thickness to very thick sandy topsoil, sometimes with hard carbonate fragments, over brown or grey sodic clay or clay loam. Fine carbonate accumulation occurs in the lower subsoil or subsoil. Found in depressions.

**Further information:** [DEWNR Soil and Land Program](#)

