BOS Bay of Shoals Land System

Low-lying plains with low rises, saline lagoons, and drainage flats. Bordered by the sea to the east; by coastal dunes, old beach ridges, and a low hill and rise to the north; and by rises and low hills to the west and south.

Area: 34.0 km^2

Annual rainfall: 485 – 540 mm average

Geology: In the west of the system are recent alluvial outwash sediments (Pooraka Formation), mostly derived from the basalt capped Wisanger Hills. These unconsolidated sediments are usually cracking clays, sometimes covered by loamy or clay loamy topsoil, deposited in drainage depressions, low-lying plains, and a lagoonal depression. Rises of deep unconsolidated cracking clay sediments also occur in this area, these show signs of Permo-Carboniferous age glacial activity, such as the presence of various smooth and somewhat rounded stones and gravel (Cape Jervis Formation).

In the central part of the system are low-lying old lagoon/sea floor deposits, consisting of deep unconsolidated clay with a covering of loamy topsoil. The low rises which occur in this area are either lunettes or old beach ridges. Many of these rises are calcreted. Calcrete either caps limestone (Glanville Formation, etc.) or calcarenite (Bridgewater Formation) in this area.

The eastern part of the system has calcrete capped calcarenite on old beach ridges (Bridgewater Formation), and calcreted plains.

Lagoonal sediments are mostly Holocene age marl, however, the western-most lagoon consists of cracking clay outwash sediments.

The youngest sediments include an area of samphire flat (marsh facies of St. Kilda Formation), and some low shelly coastal dunes (Semaphore Sand member of St. Kilda Formation).

Topography: Low-lying plains, plains, drainage flats, low rises, and lagoonal depressions. Some low rises are lunettes, while others have been formed as old beach ridges. Emu Bay Creek in the very west of this system drains parts of the Wisanger Hills, and the eastern side of the low hill south of Cape D'Estaing, northward into the sea, where it cuts through coastal sand dunes near Emu Bay. Slopes are mostly from 0 - 2%, with a few up to 8%.

Elevation: From near 60 m in the upper reaches of Emu Bay Creek, to sea-level

Relief: Mostly less than 10m

Main Soils:

Main soils:	**F2a-F1-D7-D1**	Loamy topsoil over sodic clay
	E3	Cracking clay
	B3-B6-B2	Shallow soil on calcrete
Minor soils:	**M4-F2b**	Clay loamy soil

Main Features: In this system with many low-lying areas, saline seepage is a significant problem. Cracking clay soils are fertile but difficult to manage due to their heavy surface textures and often poor surface structure, and are often marginally saline in this system. Texture contrast soil areas have sodic subsoils which are relatively impermeable, and so limit infiltration and moisture holding capacity. Calcrete rubble creates management difficulties: and these soils tend to occur on the areas least affected by saline seepage.

Soil Landscape Unit summary: Bay of Shoals Land System (BOS)

SLU	% of area	Main features #
HBK HBL HBM	1.5 2.0 0.5	Mostly arable raised plain and slopes with texture contrast soils and some cracking clays. Main soils: >20% cracking clay or clay loamy soil: **E3** and **M4**-**F2b** (*Brown-Red Vertosol* and *Red-Brown Dermosol-Sodosol*). And loamy topsoil over sodic clay - subsoil clay is brown **F2a**-**F1** (*Brown Sodosol*). **HBK** - raised plain with <10% saline seepage (2-3s) **HBL** - slopes with <10% saline seepage (1.5-3.5%, 2e, 3s) **HBM** - slopes with <10% saline seepage (3-8%, 3e, 2-3s)
HEL	1.0	Arable slopes with texture contrast soils and calcareous soils. Main soils: loamy topsoil over sodic clay - loamy topsoil over red or brown sodic clay **F2a**-**F1** (*Red-Brown Sodosol*). With loamy to clay loamy calcareous soil with hard carbonate fragments, sometimes overlying a calcrete layer **A5**-**B2** (Supracalcic-Lithocalcic-*Petrocalcic Calcarosol*) **HEL** - slopes to slight slope with <10% saline seepage (1-3%, 2-1e, 2s)
HYK HYL HYO HYT	4.1 1.0 3.2 0.9	Arable low rises, plains and depressions with texture contrast soils. Main soils: loamy topsoil over sodic clay - sandy loam to loamy sand over brown sodic-cracking clay **F2a**-**F1** (*Brown Sodosol*). Minor to limited cracking clay or clay loamy soil: **E3** and **M4**-**F2b** (*Brown Vertosol* and *Brown Dermosol-Sodosol*). **HYK** - plains with <10% saline seepage (3s) **HYL** - low rises with <10% saline seepage (1-3%, 2-1e, 2-3s) **HYO** - depression flat with <10% saline seepage (3^+s). Old sea floor with some outwash areas. **HYT** - drainage depression with 10-50% saline seepage (2g, 4-3*s)
HZK	1.4	Arable plains/low lunettes with texture contrast soils. Main soils: loamy topsoil over sodic clay - subsoil clay is brown **F2a**-**F1** (*Brown Sodosol*) **HZK** - plain with <10% saline seepage (2-3s)
JGA	0.2	Semi-arable raised outwash plain with stony and rubbly red texture contrast soils. Main soils: stony grey calcareous loamy topsoil over red clay with sandstone fragments **D7** (*stony Effervescent Red Sodosol-Chromosol*) and rubbly grey calcareous loamy topsoil over red clay with hard carbonate fragments, often overlying a calcrete layer **D3**-**B6** (Effervescent Supracalcic-Lithocalcic-Petrocalcic Red Sodosol-Chromosol). **JGA** - raised outwash plain (1-2e)
JQO	2.8	Arable to semi-arable drainage depression outwash flats and lower slopes with texture contrast soils. Main soils: loamy topsoil over sodic clay with brown clay subsoil, some formed on weathered rock **F2a**-**F1**-**D7**-**D1** (*Brown Sodosol*). Minor areas of deep loamy alluvial soils beside creek lines (**M1**). **JQO** - drainage depression outwash flats and lower slopes with <10% saline seepage (0-4%, 2-1e, 3g, 3^+s)
KST	5.4	Semi-arable drainage depression outwash flats and lower slopes with cracking clay soils. Main soils: >80% cracking clay soil **E3** (*Brown-Grey Vertosol*). With some loamy topsoil over sodic clay with brown clay subsoil **F2a** (*Brown Sodosol*) and some clay loamy soil **M4**-**F2b** (*Brown Dermosol-Sodosol*). **KST** - drainage depression flats and lower slopes with 10-50% saline seepage (0-4%, 2-1e, 4g, 4-3*s)
KWK KWT	0.4 10.7	Semi-arable outwash plains with cracking clay soils and some texture contrast soils with gilgai landscape features. Main soils: >50% cracking clay soil **E3**-**E2**-**E1** (*Brown-Grey-Red-Black Vertosol*). With loamy topsoil over sodic clay with brown clay subsoil **F2a** (*Brown Sodosol*) and some clay loamy soil **M4**-**F2b** (*Brown Dermosol-Sodosol*). **KWK** - outwash plain with <10% saline seepage (3s) **KWT** - low-lying outwash plain and drainage area with 10-50% saline seepage (0-1%, 1-2e, 2g, 4-3*s)
MgYB	0.5	Non-arable old coastal dune. Main soils: shallow soil on calcrete - shallow calcareous loamy to sandy soils on calcreted calcarenite **B2** (*Petrocalcic Calcarosol*). **MgYB** - old coastal dune (5-10m high, slopes 3-8%, 3e)

MpA MpB	3.4 2.3	Non-arable to semi-arable low remnant old beach ridges with shallow soil on calcreted calcarenite. Main soils: shallow soil on calcrete - rubbly shallow soil on calcrete **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*). **MpA** - low rises (0-2%, 1-2e) **MpB** - rises (2-6%, 2-3e)
MqB Mqa Mqb	5.8 0.5 1.2	Semi-arable low remnant old beach ridge with shallow soil on calcrete and some deeper soil. Base of limestone or calcarenite with calcrete cap. Main soils: shallow soil on calcrete - rubbly loamy soil on calcrete at shallow depth **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*). With some deeper soils: loamy topsoil over sodic clay with brown or red sodic clay subsoil **F2a**-**F1** (*Brown-Red Sodosol*), or sometimes calcareous loamy soils with hard carbonate fragments **A5** (Lithocalcic-Supracalcic Calcarosol). **MqB** - rise. Old beach ridge (0-5%, 2-1e) **Mqa** - low rise with <10% saline seepage (1-2%, 1e, 2-3s) **Mqb** - slopes with <10% saline seepage (1-5%, 2e, 2g, 2-3s)
RXO	1.2	Non-arable calcreted low-lying plains. Main soils: shallow soil on calcrete **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*). **RXO** - low-lying plain with <10% saline seepage (3s)
RYK RYO RYT	10.5 1.2 1.6	Semi-arable calcreted plains and slopes. Main soils: shallow soil on calcrete **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*). With loamy topsoil over sodic clay with brown or red clay subsoil, often containing hard carbonate fragments **F2a**-**F1** (*Brown-Red Sodosol*). **RYK** - plain with <10% saline seepage (2-3s) **RYO** - slight slopes and depression areas with <10% saline seepage (0-2%, 1-2e, 2-3s) **RYT** - drainage depression with 10-30% saline seepage (0-2%, 1-2e, 4-3*s)
TNL TNM	1.2 0.5	Mostly arable low rises and slopes with cracking clay soils. Main soils: cracking clay and clay loamy soil: **E3** and **M4**-**F2b** (*Brown Vertosol* and *Brown-Red Dermosol-Sodosol*). With minor to limited loamy topsoil over sodic clay with brown clay subsoil **F2a**-**F1** (*Brown Sodosol*). **TNL** - low rise with <10% saline seepage (2e, 2-3s) **TNM** - slopes with <10% saline seepage (3e, 2-3s)
VBA VBB VBC	12.9 0.8 1.9	Arable to non-arable old sea/lake floor. Low-lying plains with texture contrast soils. Main soils: sandy loam over sodic clay with brown clay subsoil, some with hard carbonate or even cemented shell fragments **F2a** (*Brown Sodosol*). With minor to limited shallow soil on calcrete **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*). Possibly minor calcareous loamy to clay loamy soil with hard carbonate fragments **A5** (Supracalcic-Lithocalcic Calcarosol). **VBA** - low-lying plain with <10% saline seepage (3^{+}s) **VBB** - old lagoon floor with marginal salinity (4-3s) **VBC** - low-lying saline plains (5s). Mostly sea-barley grass with some samphire plants and salt encrusted bare patches.
WGE WGR	1.4 0.6	Non-arable coastal dunes. Main soils: grey fine shell sand over white fine shell sand with shell fragments **H1** (Shelly Calcarosol). Some areas with some shallow soil on calcrete. **WGE** - low coastal dunes (<5m high) **WGR** - saline coastal flats (5-4s)
WQ-	2.7	Non-arable coastal swamps (7s). Samphire and salt flats.
ZA-	0.8	Non-arable saline depressions and flats (5s). Sea barley grass, sometimes with samphire or bare salt encrusted areas. Main soils: loamy topsoil over sodic clay with brown sodic-cracking clay subsoil **F2a** (*Brown Sodosol*). With some cracking clay and/or clay loamy soil: **E3** and/or **M4**-**F2b** (*Brown-Grey Vertosol* and/or *Brown Dermosol-Sodosol*).
ZB-	4.3	Non-arable highly saline depressions and drainage depressions (7s). Samphire and bare salt encrusted areas, with some sea barley grass areas. Main soils: loamy topsoil over sodic clay - loamy topsoil, or sometimes with a clay loamy surface over a loamy subsurface, on a brown sodic clay subsoil, some with calcrete fragments **F2a** (*Brown Sodosol*).
ZL2 ZL4	1.3 1.1	Lunettes. **ZL2** - semi-arable lunette (2-5m). Main soils: shallow soil on calcrete **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*). With deeper clay loamy soil clay - clay loamy topsoil over red or brown sodic clay **M4**-**F2b** (*Red-Brown Dermosol-Sodosol*).

		ZL4 - arable lunette (2-5m). Main soils: clay loamy soil - clay loamy topsoil over red or brown sodic clay **M4**-**F2b** (*Red-Brown Dermosol-Sodosol*). With minor shallow soil on calcrete **B3**-**B6**-**B2** (*Petrocalcic Tenosol-Chromosol-Calcarosol*).
ZR-	0.8	Non-arable saline lagoon (5-7s). Salinity levels have obviously risen in this area since clearing and settlement as evidenced by dead eucalypt trees in the lagoonal depression. Main soils: wet cracking clay **N2a** (Dermosolic Hydrosol)
ZS-	6.4	Non-arable highly saline lagoons (8-7s). Salt encrusted lagoons. Main soils: deep calcareous clay loamy to light clayey soil **N2b** (Calcarosolic Hydrosol)

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:

F2a-**F1**-**D7**-**D1** Loamy topsoil over sodic clay (*Brown-Grey-Red Sodosol*). Medium thickness to thick sandy loam or occasionally loam, often with a bleached layer, over brown or sometimes grey sodic clay, on clay with fine carbonate. The clay subsoil can be cracking clay. Soil profile can include: rock fragments (quartz, quartzite and/or shale) on lower slopes and low rises in the west of the system; shelly fragments in some low-lying flats in the central part of the system; or hard carbonate fragments, sometimes with a red clay subsoil, in some areas in the central or east part of the system. Near the coast soils can be calcareous throughout. Found on flats, drainage flats, slopes and some low rises.

E3 Cracking clay (*Grey-Brown-Red-Black Vertosol*). Thin to medium thickness clay over coarsely structured grey, brown, or sometimes red or black, cracking-sodic clay. With fine carbonate in the lower subsoil or subsoil; some soils on gilgai mounds are calcareous throughout. Often these areas have gilgai landscape features of flats, mounds and crabholes. Some soils have some coarse fragments (quartz, quartzite, shale, basalt, and/or ironstone fragments) which are often smooth and somewhat rounded. There is often a thin (<3 cm) cover of loamy or clay loamy surface soil. Found on flats, drainage flats, slopes, some low rises, and including gilgai landscape areas.

B3-**B6**-**B2** Shallow soil on calcrete (*Petrocalcic Tenosol-Chromosol-Calcarosol*). Rubbly sandy loam, often over a rubbly light clay or clay loam subsoil, on calcrete at shallow depth. Usually with fine carbonate in the subsoil, sometimes calcareous throughout. Found on old beach ridges, some lunette areas, plains, and a few low-lying areas.

Minor soils:

M4-**F2b** Clay loamy soil (*Brown-Red Dermosol-Sodosol*). Loam to clay loamy topsoil over red or brown sodic clay, on clay with fine carbonate. The clay subsoil is often cracking clay: excepting lunettes. Occasionally the topsoil has a bleached sub-surface layer. Often the subsoil is red when situated on a lunette. The soil can include rock some fragments (quartz and/or quartzite), or even have weathered rock within the top 1m, when on slopes or low rises in the west of the system. Found on slopes, some lunette areas, and some flats.

Further information: DEWNR Soil and Land Program