GEO George Land System

Area: 341.5 km^2

Landscape: Wet sub-coastal plain with salt lakes, swamps, low sandy rises and samphire flats. It includes Lakes George, St. Claire and Eliza, between Beachport and Robe.

Annual rainfall: 680 – 770 mm average

Geology: Holocene Saint Kilda Formation lagoonal sediments. Pleistocene Bridgewater Formation calcarenite forms part of the inland edge.

Main soils:
WW (21%) Water
N2 (21%) Saline soil (Salic-Hypersalic Hydrosol)
B3 (12%) Shallow sandy loam on calcrete (Petrocalcic Red Tenosol-Kandosol-Rudosol)
N3 (12%) Wet soil (non to moderately saline) (Sodosolic-Calcarosolic-Dermosolic Hydrosol)

Minor soils:
H2 (9%) Calcareous siliceous sand (sandy Calcarosol-Tenosol)
N1 (7%) Peaty soil (Organosol)
B7 (4%) Shallow sand over clay on calcrete (sandy Petrocalcic Sodosol-Chromosol)

Summary: Wet and saline soils occupy large proportions of this land system. The limitations are poor drainage, salinity and propensity for flooding to occur. The near-coastal position also means that the land is exposed to strong winds.

Soil Landscape Unit summary: George Land System (GEO)

SLU	% of area	Component	Main soils	Prop#	Notes
MAC	0.1	Rise	B3RR	D	Undulating calcreted former beach ridges with stony, very shallow red and brown loam, occasionally over red clay, on calcrete. >50% bare calcrete. Main soils: Shallow sandy loam on calcrete - **B3** and Rock or exposed calcrete – **RR**.
M-B	0.1	Stony rise	B3RR	V	**M-B** Gently undulating rises, as above but <50% bare calcrete. 10-20% swales with shallow sandy loam, mostly over poorly structured brown, or red clay on calcrete; 10-30% of swale areas have very shallow sandy loam on calcrete, soils or bare calcrete. **M-C** Steeper, undulating rises as above. **M-G** Plain with shallow sand, often over poorly structured clay, or bleached sand, on calcreted calcarenite. <10% wet depressions with alkaline peat or dark loamy wet soils. Main soils: ***Rises:*** Shallow sandy loam on calcrete - **B3** and Rock or exposed calcrete – **RR**. ***Swales:*** Sand over friable brown clay on calcrete - **B7** and Shallow sandy loam over red-brown clay on calcrete - **B6**. ***Plains:*** Shallow sandy loam on calcrete - **B3**, Sand over friable brown clay on calcrete - **B7** and Shallow sand on
		Swale	B7B6	L	
M-C	0.04	Rise	RRB3	D	
M-G	0.1	Plain	B3B7B8	D	
		Depression	N1N3	M	

					calcrete - **B8**. ***Depressions:*** Wet clay loam - **N3** and Peaty soil – **N1**.
MNC	0.1	Stony rise	B3	E	Undulating stony rises with co-dominant dunes. Shallow sandy loam, often over red clay on the rises; deep siliceous sand, often calcareous or with shelly sand, on dunes. <10% swamps with wet saline loams or alkaline peat soils. Main soils: ***Stony rises:*** Shallow sandy loam on calcrete - **B3**. ***Dunes:*** Deep brown sand - **H2**. ***Swamps:*** Wet saline clay loam – **N2c**, Peaty soil – **N1**.
		Dune	H2	E	
		Swamp	N2N1	M	
MtD	0.1	Stony rise	B8RR	D	Stony rises with shallow bleached sand over calcrete, or bare calcrete. Main soils: Shallow sand on calcrete - **B8** and Rock or exposed calcrete – **RR**.
MUB	0.6	Stony rise	B3RR	D	Stony rises with shallow sand over calcrete, or bare calcrete. 10-30% of soils are thin calcareous loams on calcrete; 10-30% are shallow sandy loam over red sandy clay on calcrete. Main soils: Shallow sandy loam on calcrete - **B3** and Rock or exposed calcrete – **RR**.
MWL	10.8	Plain	B3B7	V	Plains with shallow sandy loam, often over poorly structured brown clay, on calcrete. 10-30% each of shallow sandy loam over red clay on calcrete; deep sand, bleached and unbleached.20-30% swamps with wet loam over dark clay soils or peat. Main soils: ***Plains:*** Shallow sandy loam on calcrete - **B3**, Sand over friable brown clay on calcrete - **B7**. ***Swamps:*** Wet clay loam - **N3** and Peaty soil – **N1**.
		Swamp	N3N1	C	
VaO	0.8	Plain	B3	E	**VaO** Sub-coastal lagoon plain with shallow calcareous siliceous sand on calcreted calcarenite. 20-30% dunes with calcareous siliceous sand. 10-20% swamps with loamy wet soils, occasionally peaty. **VaQ** Sub-coastal lagoon plain with shallow sand, occasionally over poorly structured clay on calcrete. 10-20% swamps as above. Main soils: ***Plains:*** Shallow sandy loam on calcrete - **B3**. ***Dunes:*** Deep brown sand - **H2**. ***Swamps:*** Wet clay loam - **N3**.
		Dune	H2	C	
		Swamp	N3	L	
VaQ	2.2	Plain	B3	V	
		Swamp	N3	L	
VdA	1.4	Plain	B7F2	D	**VdA** Sub-coastal lake margin plain with loam over poorly structured dark clay, mostly shallow over calcrete. 10-30% wet soils. **VdC** Sub-coastal lake margin plain with mostly shallow sand over calcrete; in association with wet soils and deep calcareous siliceous sands on rises. 10-30% bare calcrete; 10-30% water. **VdP** Sub-coastal lake margin plain with deep, often calcareous clay loam over marl. Often wet. 20-30% swamps with wet soils as above. 10-30% of swamps are peats or deep calcareous clay loam over marl. 20-30% rises with shallow loam, often with thin sandy clay subsoils, on calcrete; and occasionally, rubbly calcareous loam or gypseous calcareous loam
VdC	0.3	Flat	B3N3H2	D	
VdP	2.4	Flat	C5A7N3	E	
		Swamp	N3C5	C	
		Rise	B3	C	

					Main soils: ***Plains:*** Sand over friable brown clay on calcrete - **B7** and Sandy loam over poorly structured brown or dark clay - **F2**. ***Flats:*** Shallow loam on calcrete - **B3**, Wet clay loam - **N3**, Deep brown sand - **H2**, Gradational dark clay loam – **C5** and Calcareous clay loam on marl - **A7**.
VeR	0.6	Plain	B5B2	D	Lagoon margin plain with shallow dark clay loam, often over dark clay, on calcrete. 10-30% bare calcrete. 10-30% wet dark clay loams. Main soils: Shallow dark clay loam on limestone - **B5** and Shallow calcareous loam on calcrete - **B2**.
VfG	5.4	Flat	B3	E	Shallow (<30cm deep) soils on marine limestone or calcrete. **VfG** Lagoon margin flat with shallow sand over calcrete. 20-30% stony rises with shallow sand over calcrete. 10-20% dunes with calcareous siliceous sands. 10-20% swamps with, often saline, wet sandy loam to loam soils. **VfP** Flats as above, also with bleached sand on calcrete. 10-20%stony rises. **VfQ** Swampy flats with shallow, mostly calcareous, dark clay loam, often over clay on calcrete. **VfR** Stony plain with shallow dark clay loam, occasionally over dark clay, on calcrete. 30-60% flats with deep calcareous clay loam over marl or rubble. Main soils: ***Flats:*** Shallow loam on calcrete - **B3**, Shallow sand on calcrete - **B8**, Shallow dark clay loam on limestone - **B5**, Calcareous clay loam on marl - **A7** and Rubbly calcareous loam on clay - **A5**. ***Stony rises:*** Shallow loam on calcrete - **B3** and Shallow sand on calcrete - **B8**. ***Dunes:*** Deep brown sand - **H2**. ***Stony plains:*** Shallow calcareous loam on calcrete - **B2**. ***Swampy flats:*** Shallow calcareous loam on calcrete - **B2**, Shallow dark clay loam on limestone - **B5** and Wet clay loam - **N3**. ***Swamps:*** Wet clay loam - **N3** and Wet saline clay loam - **N2c**.
		Stony rise	B3	C	
		Dune	H2	L	
		Swamp	N2N3	L	
VfP	3.0	Flat	B3B8	V	
		Stony rise	B3B8	L	
VfQ	0.1	Swampy flat	B2B5N3	D	
VfR	0.3	Stony plain	B2	E	
		Flat	B5A7A5	E	
ViN	1.1	Flat	H2N3	V	Moderately deep to deep soils on marine limestone or calcrete. **ViN** Flats with deep calcareous siliceous sand, often wet; 10-30% each of; shallow sandy loam over poorly structured dark clay; saline wet soil; shallow sandy loam on calcrete. 10-20% sandy rises with deep calcareous siliceous sand. <10% swamps with mainly non-peaty wet soils, occasionally saline or sandy or peat. **ViP** Flat with shallow sand on calcrete; co-dominant with swamps with soils as above. Main soils: ***Flats:*** Deep brown sand - **H2**, Shallow loam on calcrete - **B3** and Wet clay loam - **N3**. ***Sandy rises:*** Deep brown sand - **H2**. ***Swamps:*** Wet clay loam - **N3**.
		Sandy rise	H2	L	
		Swamp	N3	M	
ViP	0.2	Flat	B3	E	
		Swamp	N3	E	
VoB	0.3	Flat	H2N3	D	Soils on unconsolidated sediment. Swamps with mostly non-peaty, sandy to loamy wet soils, occasionally saline or sandy or peat.
VoG	2.2	Lake plain	H2N3	V	
		Swamp	N3	L	

VoN	2.1	Flat	H2N3	V	**VoB** Flats with deep calcareous siliceous sand, often wet; 10-30% each of; shallow sandy loam over poorly structured dark clay; saline wet soil; shallow sandy loam on calcrete. **VoG** Flats as above. 10-20% **VoN** Flats as above. 20-30% sandy rises with deep calcareous siliceous sand. **VoO** Sandy rises with deep calcareous siliceous sand. 20-30% flats, as above. 20-30% swamps, as above. **VoQ** Co-dominant flats and swamps, as above. Main soils: ***Flats and lake plains:*** Deep brown sand - **H2** and Wet clay loam - **N3**. ***Sandy rises:*** Deep brown sand - **H2**. ***Swamps:*** Wet clay loam - **N3**.
		Sandy rise	H2	C	
VoO	4.9	Sandy rise	H2	E	
		Flat	H2N3	C	
		Swamp	N3	C	
VoQ	0.1	Flat	H2N3	E	
		Swamp	N3	E	
VtB	0.1	Swampy flat	A1B3N3	D	Miscellaneous shoreline deposits, including sands, clays, saltpan and reed beds. **VtB** Swampy flats with deep, highly calcareous sandy loam; shallow sandy loam on calcrete; or wet, non-peaty loam, soils. 10-30% peat. **VtO** Swampy flats as above; 30-60% sandy rises with deep calcareous siliceous sand. **VtQ** Swampy flats as above; 30-60% swamps with mostly non-peaty, sandy to loamy, often saline, wet soils 10-30% peat. Main soils: ***Swampy flats:*** Highly calcareous sandy loam - **A1**, Shallow loam on calcrete - **B3** and Wet clay loam - **N3**. ***Sandy rises:*** Deep brown sand - **H2**. ***Swamps:*** Wet clay loam - **N3** and Wet saline clay loam - **N2c**.
VtO	0.1	Swampy flat	A1B3N3	V	
		Sandy rise	H2	E	
VtQ	0.1	Flat	A1B3N3	V	
		Swamp	N3N2	E	
WEE	1.3	Dune	H1H2	D	Coastal and sub-coastal low dunes and sand spreads with deep calcareous siliceous and calcareous sand. <10 swales with mostly wet sandy soils and occasionally, peats. Main soils: ***Dunes:*** Shell sand - **H1** and Deep brown sand - **H2**. ***Swales:*** Wet clay loam - **N3**.
		Swale	N3	M	
Xad	0.5	Low dune	H2	V	Low sandy rises and poorly drained sand plain with deep calcareous siliceous sand, often wet. 20-30% swamps with mostly non-peaty deep loam over sand, and deep sand soils. Occasional peat. Main soils: ***Dunes:*** Deep brown sand - **H2**. ***Swamps:*** Wet clay loam - **N3**, Deep brown sand - **H2**.
		Swamp	N3H2	C	
Xj-	0.2	Lake beach	H2WW N3	D	Lake beaches with deep loam, or calcareous siliceous sand, often wet or submerged. Main soils: Wet clay loam - **N3**, Deep brown sand - **H2**.
Xk-	0.2	Reed beds	N3N1 WW	D	Reed beds with wet darl loam or peats; often submerged. Main soils: Wet clay loam - **N3** and Peaty soil – **N1**.
Xl-	16.8	Lake	WW	D	Water filled lake.
Xqf	0.6	Swamp	N3B3	D	Swamps with non-peaty dark loam over clay or shallow dark loam over calcrete. 10-30% water filled.

					Main soils: Wet clay loam - **N3** and Shallow sandy loam on calcrete - **B3**.
Xta	1.3	Swamp	N1	V	Peat swamps. **Xta** Peat swamps; 20-30% sand rises with deep, moderately to well drained, bleached siliceous sands. **Xtc** Swamps with shallow, dark clay loam over clay on calcrete, often wet. 10-30% alkaline peat soils. 10-20% rises with shallow, mostly calcareous loam over calcrete soils. 10-30% bare calcrete rock. **XtC** Peat swamps. 10-30% of area is; often wet, non-peaty, dark loam over dark clay. **Xtf** Swamps as for **Xtc** above, 20-30% rises. Main soils: ***Swamps:*** Peaty soil – **N1**, Shallow dark clay loam on limestone - **B5** and Wet clay loam - **N3**. ***Sandy rises:*** Wet highly leached sand - **I2**. ***Stony rises:*** Shallow calcareous loam on calcrete - **B2** and Shallow sandy loam on calcrete - **B3**.
		Rise	I2	C	
Xtc	0.1	Swamp	B5N3	V	
		Rise	B2B3	L	
XtC	3.2	Swamp	N1	D	
Xtd	1.6	Swamp	N1	V	
		Rise	I2	C	
Xtf	4.5	Swamp	B5N3	V	
		Rise	B2B3	C	
XuC	1.4	Swamp	N3	D	**XuC** Swamps with wet deep sand soils. 10-30% peat. **Xud** Swamps as above; <10% sandy rises with deep calcareous siliceous sand. **XuD** Swamps with wet, non-peaty, dark loam over dark clay. 10-30% water filled. **Xue** Swamps with wet, non-peaty, dark clay loam over dark clay. 10-30% water filled. 20-30% rises with deep calcareous loam soils; 10-30% deep calcareous sand. **Xuf** Swamps with wet, non peaty dark clay soils. 10-30% water filled. 20-30% stony rises with shallow clay loam, often calcareous, or over thin dark clay, on calcrete. Main soils: ***Swamps:*** Wet clay loam - **N3**. ***Sandy rises:*** Deep brown sand - **H2**, Wet clay loam - **N3**. ***Stony rises:*** Shallow calcareous loam on calcrete - **B2**, Shallow sandy loam on calcrete - **B3** and Shallow dark clay loam on limestone - **B5**. ***Non-stony & non-sandy rises:*** Deep moderately calcareous loam - **A3**.
Xud	1.2	Swamp	N3H2	D	
		Sandy rise	H2	M	
XuD	0.1	Swamp	N3	D	
Xue	0.1	Swamp	N3	V	
		Rise	A3	C	
Xuf	0.02	Swamp	N3	V	
		Stony rise	B2B3B5	C	
Xv-	0.01	Sand bar	H2	V	Sand bars with deep calcareous siliceous sand. 20-30% swamps with mostly wet dark clay loam, often saline; 10-30% water filled. Main soils: ***Sand bars:*** Deep brown sand - **H2**. ***Swamps:*** Wet clay loam - **N3** and Wet saline clay loam - **N2c**.
		Swamp	N3N2	C	
Xxf	0.04	Swamp	N1N3 WW	V	Swamps with deep, alkaline to neutral peats, organic loam over clay, or water filled.; 10-20% stony rises with shallow calcareous clay loams, or siliceous sand, over calcrete or shallow dark clay loam on dark clay on calcrete. Main soils: ***Swamps:*** Peaty soil – **N1** and Wet clay loam - **N3**. ***Stony rises:*** Shallow calcareous loam on calcrete - **B2**, Shallow sandy loam on calcrete - **B3** and Shallow dark clay loam on limestone - **B5**.
		Stony rise	B2B3B5	L	
Xy-	0.1	Lunette	H1H2	D	Lunettes with deep calcareous and calcareous siliceous sands.

					Main soils: Shell sand - **H1** and Deep brown sand - **H2**.
Xz-	0.7	Swamp	N1N3 WW	E	Swamps with peat, dark organic loam soils or water filled; co-dominant with lunettes with shallow loam on calcrete, 10-30% with red clay subsoils. Main soils: ***Swamps:*** Peaty soil – **N1** and Wet clay loam - **N3**. ***Lunettes:*** Shallow sandy loam on calcrete - **B3**.
		Lunette	B3	E	
ZA-	0.2	Plain	N1B3	D	Plains with peat and shallow, dark moderately saline sandy loam over calcrete. 10-30% saline wet soils. Main soils: Peaty soil – **N1** and Shallow sandy loam on calcrete - **B3**.
ZB-	1.6	Samphire flat	N3N2	V	Samphire flats with wet non-saline and saline dark sandy loam over dark organic clayey and sandy sediments. 20-30% dunes with deep calcareous and calcareous siliceous sands. Main soils: ***Samphire flats:*** Wet clay loam - **N3** and Wet saline clay loam - **N2c**. ***Dunes:*** Shell sand - **H1** and Deep brown sand - **H2**.
		Dune	H1H2	C	
ZD-	19.9	Salt lake	N2	D	Salt lakes, with bare salt crusts; occasionally water filled. Main soils: Wet saline clay loam - **N2c**.
ZE-	3.4	Lake margin	N2	D	Saline lake margin with wet saline loams. Occasional wet non-saline loam or peat. Main soils: Wet saline clay loam - **N2c**.
ZG-	1.1	Lake bed	N2	D	Saline lake bed with wet saline dark sandy loam soils. 10-30% each of peat, calcareous siliceous sand and calcareous sand. Main soils: Wet saline clay loam - **N2c**.
ZI-	0.2	Salt lake	N2	V	Salt lake with bare salt crusts or water covered. 20-30% lunettes with shallow sandy loam on calcrete or deep calcareous clay loam on marl. Main soils: ***Salt lake bed:*** Wet saline clay loam - **N2c**. ***Lunettes:*** Shallow sandy loam on calcrete - **B3** and Calcareous clay loam on marl - **A7**.
		Lunette	B3A7	C	
ZK-	0.3	Salt lake	N2	V	Salt lake with bare salt crusts or water covered. 20-30% dunes with deep calcareous and calcareous siliceous sands. Main soils: ***Salt lake bed:*** Wet saline clay loam - **N2c**. ***Dunes:*** Shell sand - **H1** and Deep brown sand - **H2**.
		Dune	H1H2	C	

PROPORTION codes assigned to Soil Landscape Unit (SLU) components:

D	Dominant in extent (>90% of SLU)	C	Common in extent (20–30% of SLU)
V	Very extensive in extent (60–90% of SLU)	L	Limited in extent (10–20% of SLU)
E	Extensive in extent (30–60% of SLU)	M	Minor in extent (<10% of SLU)

Detailed soil profile descriptions:

A1 Highly calcareous sandy loam (Supravescent Calcarosol)
Deep to moderate depth carbonate dominant soils. Loamy sand to sandy loam over sandy loam to sandy clay loam. Carbonate dominates the soil profile as a whole, however, the surface soil may not be carbonate dominant, but must contain 30% or more carbonate.

A3 Deep moderately calcareous loam (Calcic Calcarosol)
Calcareous loamy-clay loamy topsoil grading into loamy-clay loamy subsoil without a significant CO_3 buildup in the subsoil (<20% CO_3 in subsoil). Pediment type Calcarosols.

A5 Rubbly calcareous loam on clay (Supracalcic-Lithocalcic Calcarosol on clay)
Calcareous sandy-clay loamy topsoil grading into loamy-clay loamy subsoil on a clayey substrate. Usually (always?) rubbly. Clayey substrate (Blanchetown Clay equivalent: lmc or heavier) occurs at >60 cm(?) and <120 cm.

A7 Calcareous clay loam on marl (Marly Calcarosol)
Dark calcareous clay with a marly subsoil (often saline in Upper SE). Often with shells and a peaty surface.

B2 Shallow calcareous sandy loam on calcrete (Petrocalcic Calcarosol)
Up to 40 cm calcareous loamy sand to sandy loam with variable calcrete rubble overlying calcreted calcarenite - rises.

B3 Shallow sandy loam on calcrete (Petrocalcic Rudosol)
Medium thickness non calcareous sandy loam, often having a slight clay increase with depth, over calcreted calcarenite shallower than 50 cm - rises.

B5 Shallow dark clay loam on limestone (Petrocalcic, Black Dermosol)
Black clay loam to light clay over calcreted limestone at shallow depth, grading to highly calcareous clay - flats.

B6 Shallow sandy loam over red-brown clay on calcrete (Petrocalcic, Red Kandosol)
Medium thickness sandy loam with slight ironstone gravel overlying a weakly structured reddish brown sandy clay on calcarenite within 50 cm - rises.

B7 Shallow sand over sandy clay on calcrete (Petrocalcic, Brown Chromosol)
Medium thickness sand overlying brown friable sandy clay to clay on limestone or calcreted sandy clay within 50 cm - flats.

B8 Shallow sand on calcrete (Petrocalcic, Bleached-Leptic Tenosol)
Thick bleached sand over calcreted calcarenite within 50 cm - rises.

C5 Gradational dark clay loam (Calcic-Hypercalcic Brown-Grey-Black Dermosol-Calcarosol)
Dark clay loam over abundant 'soft lime'. >10% carbonate is the cut off between this and M2 soils.

F2 Sandy loam over poorly structured brown or dark clay (Brown-Dark Sodosol-Chromosol)
Topsoil <30 cm over a poorly structured subsoil. Loamy, often sandy loam, to clay loamy texture contrast soil with a sodic/dispersive/poorly structured brown clayey subsoil. Often sandy loam, usually with a bleached horizon, and thin topsoil over a poorly structured B.

H1 Shell sand (Shelly Rudosol)
Very thick shell sand with no profile development other than slight organic darkening at the surface.

H2 Siliceous sand (Sandy Calcarosol-Tenosol)
Deep to moderate depth calcareous siliceous sand. Often with non-calcareous topsoil; can be non calcareous throughout. Sometimes the subsoil is a light sandy loam.

I2 Wet highly leached sand (Fragic, Humic, Aquic Podosol)
Grey sand with a thick bleached A2 horizon, overlying a thin to thick layer of coffee rock, grading to pale brown sand sharply overlying a grey, brown and yellow mottled sandy clay loam to light clay.

N1 Peat (Organosol)
Peaty soil.

N2c Wet saline clay loam (Dermosolic, Salic Hydrosol)
Medium thickness dark grey to black clay loam to clay grading to well-structured dark grey clay with minor carbonates and a water table within 100 cm.

N3 Seasonally waterlogged, non to marginally saline equivalents of soils listed above, viz.:
N3d Wet **B5**
N3e Wet **B7**

RR Bare rock

WW Water

Further information: DEWNR Soil and Land Program