WNR West Naracoorte Range Land System

Range of low hills extending from north east of Willalooka to Morambro Creek

Area: 436.6 km^2

Annual rainfall: 500 - 550 mm average

Geology: The land system is formed on ancient coastal dune which has become indurated at the surface to form calcarenite. The system is a single range, which probably derived from the coalescence of several closely spaced dunes. Closed depressions within the range may be remnants of original inter-dune lagoons, or large solution features. They contain clayey sediments. There are intermittent sand spreads derived from reworking of the silica component of the original calcareous dune sands. Granitic intrusions, a feature over much of the upper South East, protrude through the ranges at several sites.

Topography: The West Naracoorte Range is the northern extension of the Naracoorte Range. It is a massive coalesced ancient coastal dune system up to 15 km wide and up to 100 m high. It includes numerous closed depressions, the floors of which are up to 70 m below the surrounding ranges. These are generally less than two to three km^2 in area, with the notable exception of Swede Flat, which is mapped as a separate land system.

Elevation: 30 - 140 m

Relief: Overall maximum relief is 100 m. Local relief is 40 - 70 m

Soils: Sandy soils (with and without more clayey subsoils) predominate. Shallow stony soils are sub-dominant.

Main soils:

Sand spreads

H3a	Deep bleached sand
H3b	Moderately deep bleached sand
G2	Sand grading to sandy clay loam

Minor soils:

Stony rises

B2	Shallow calcareous loam on calcrete
B3	Shallow stony loamy sand on calcrete
B4	Red sandy loam on calcrete
B6	Sandy loam over red sandy clay on calcrete
B7a	Sand over friable brown clay on calcrete
B8	Shallow bleached sand on calcrete
L1	Gritty sandy loam on granite

Sandy flats and rises

G3	Thick sand over clay
G4	Sand over dispersive brown clay
B7b	Sand over friable brown clay on calcrete

Loamy flats

F1	Sandy loam over brown clay
N3	Wet soil - non to moderately saline

Main features: The West Naracoorte Range comprises two distinctive components:

- The calcarenite ridges have well drained soils which are commonly shallow and stony with moderately low fertility. Associated sand spreads have very low fertility and are prone to water repellence and wind erosion.
- In the depressions between the ranges, soils include shallow sandy soils over calcrete and sand over clay soils with impeded drainage. Overall, soils of the corridors are deeper and more fertile, but less well drained than those of the ridges.

Soil Landscape Unit summary: 18 Soil Landscape Units (SLUs) in the West Naracoorte Range Land System

SLU	% of area	Main features #
A-g	0.1	Isolated granite outcrops. There is extensive rocky outcrop and surface stone. The main soil is gritty red sandy loam on granite - **L1** (D). These areas have little agricultural value.
MHA MHB MHC MHI	0.2 0.2 67.5 2.2	Series of parallel ridges with a NNW-SSE orientation, up to 60 m high and with slopes of 3-12%. The ridges are formed on calcreted calcarenites. They are partially overlain by sand spreads which tend to be more extensive on the eastern slopes. There is variable surface stone on the non sandy slopes. **MHA** Level plain with minor sandy rises. **MHB** Gently sloping undulating rises **MHC** Undulating rises to low hills **MHI** Undulating rises to low hills with up to 10% non-saline non-swampy depressions or swales Main soils: deep and moderately deep bleached sand - **H3a/H3b** (V-E) and sand grading to sandy clay loam - **G2** (L) on sand spreads, and shallow stony loamy sand on calcrete - **B3** (M), shallow bleached sand - **B8** (M), red sandy loam on calcrete - **B4** (M), sand over friable brown clay on calcrete - **B7a** (M), shallow calcareous loam on calcrete - **B2** (M), and loamy sand over red sandy clay on calcrete - **B6** (M) on stony areas. This land is rapidly to well-drained with low salinity. The sandy soils have very low fertility and are prone to water repellence and wind erosion, but are deep and do not have structural constraints. The shallower soils on calcrete are more fertile, but productive potential is commonly limited by sub-optimal waterholding capacity. There is variable stone depending on depth of sand cover. Exposure may affect some higher land.
MNB MNC	0.2 1.8	Rises and low hills with relief up to 50m. The rises are formed on calcreted calcarenite. They are partially overlain by sand spreads which tend to be more extensive on the eastern slopes. There is variable surface stone on the non-sandy slopes. **MNB** Gently sloping undulating rises **MNC** Undulating rises to low hills Main soils: deep and moderately deep bleached sand - **H3a/H3b** (V), sand grading to sandy clay loam - **G2** (L-C) and thick sand over clay - **G3** (M). These soils are deep with low fertility, moderate waterholding capacity and rapid drainage. They are prone to water repellence, wind erosion and acidification. Minor shallow soils are similar to those in the **MHC** landscape unit. These soils are semi-arable as they are very shallow and/or stony and have moderately-low to low waterholding capacity and fertility.

MRC MRE	1.1 1.3	Undulating rises to low hills with relief up to 50m. The rises are formed on calcreted calcarenite. They are partially overlain by sand spreads which tend to be more extensive on the eastern slopes. There is variable surface stone on the non sandy slopes. **MRC** Undulating rises and low hills **MRE** Depression Main soils on rises: red sandy loam on calcrete - **B4** (C), loam over brown clay - **F1** (L), deep bleached sand - **H3** (L), sand grading to sandy clay loam - **G2** (L) and sandy loam over red sandy clay on calcrete - **B6** (L). Thick sand over clay - **G3** and shallow calcareous loam on calcrete **- B2** are minor. Main soils on flats are deep and moderately deep bleached sand - **H3a/H3b** (E), sandy loam over red sandy clay on calcrete - **B6** (L), thick sand over clay - **G3** (L), shallow calcareous loam on calcrete **- B2** and sand over friable brown clay on calcrete - **B7b** (M). The sandy soils are deep but infertile, susceptible to water repellence, wind erosion and acidification, and often excessively drained. The deeper loamier soils (B4, B6 and B2) are fertile, but productivity is commonly limited by restricted waterholding capacity due to shallow depth.
MYB MYC	0.3 0.3	Rises and low hills with relief up to 30m. The rises are formed on calcreted calcarenite. They are partially overlain by sand spreads which tend to be more extensive on the eastern slopes. There is variable surface stone on the non sandy slopes. **MYB** Gently undulating rises, 5-10 m high **MYC** Undulating rises to 30 m high Main soils: sandy loam over red sandy clay on calcrete - **B6** (E), red sandy loam on calcrete - **B4** (C), shallow calcareous loam on calcrete **- B2** (C) and shallow stony loamy sand on calcrete - **B3** (L). These soils are moderately deep to shallow with reasonable fertility and moderately low waterholding capacity. Sandy soils, including thick sand over clay - **G3**, with deep and moderately deep bleached sand - **H3a/H3b** and sand grading to sandy clay loam - **G2**, account for 20% of the area. These soils are deep but infertile and prone to water repellence, wind erosion and acidification. There are minor rocky rises with shallow stony soils and sheet rock. They have little productive value.
McA McB McC	0.5 2.4 7.1	Low hills, rises and plains formed on calcreted calcarenite. Rises are partially overlain by sand spreads which tend to be more extensive on the eastern slopes. There is variable surface stone on the non-sandy slopes. **McA** Level plain **McB** Complex of plains and gently sloping rises **McC** Undulating rises to low hills Half of the soils are deep to moderately deep sandy types, including thick sand over clay - **G3**, deep and moderately deep bleached sand - **H3a/H3b** and sand grading to sandy clay loam - **G2**. The other half are loamier and moderately shallow to shallow. They include shallow stony loamy sand on calcrete - **B3**, sand over friable brown clay on calcrete - **B7a**, red sandy loam on calcrete - **B4** and shallow calcareous loam on calcrete **- B2**. The sandy soils are infertile and prone to water repellence, wind erosion and acidification. The shallower soils are more fertile, but low waterholding capacity limits productivity.
NFG	4.6	Inter-ridge corridors, generally parallel to the ranges of MHC, but cutting through the ridges in places. Underlying materials are calcreted sandy clays and limestones or locally derived sandy outwash sediments. Adjacent to rising ground, or where the ancient dunes have been buried by lagoonal sediments, the landscape is formed on calcarenites. Main soils: sand over friable brown clay on calcrete - **B7b** (E), thick sand over clay - **G3** (E) and sand over dispersive brown clay - **G4** (E). This land is generally well drained, but dispersive G4 soils are imperfectly drained due to perching of water on clayey subsoil. Salinity is low. Soil fertility is moderately low to low due to sandy surfaces. Waterholding capacities are moderately low to moderately high depending on depth to calcrete. Surface soils are sandy and soft with no restrictions on root growth. Subsoils are well structured except in the G4 soils where root growth is impeded. There is moderate potential for wind erosion. Surface stone is very minor.

OLe	8.5	30-60% moderate jumbled sandhills draped over stony calcarenite ridges. Main soils: deep and moderately deep bleached sand - **H3a/H3b** (V) and sand grading to sandy clay loam - **G2** (L). The land is rapidly to well drained with no salinity. Soil fertility is very low to low, waterholding capacity moderately low. Soils are sandy and loose to soft with no restrictions to root growth, but they are highly susceptible to water repellence, wind erosion and acidification. Minor shallow soils where the sand cover is thin are sand over friable brown clay on calcrete - **B7a** (M) and shallow stony loamy sand on calcrete - **B3** (M). This land is semi-arable as these soils are very shallow and/or stony and have moderately low to low waterholding capacity and fertility.
OQe	1.5	Jumbled sand dune complex with 30-60% sand dune coverage and associated enclosed flats (swales). Calcified clays underlie the swales between the dunes. Main soils: deep and moderately deep bleached sand - **H3a/H3b** (E) and sand grading to sandy clay loam - **G2** (L) on sand rises, thick sand over clay - **G3** (E), sand over dispersive brown clay - **G4** (L) and sandy loam over brown clay - **F1** (M) in swales and shallow soils as for soil landscape MHC on minor stony slopes. The sandy soils of the rises are deep, infertile and prone to water repellence, wind erosion and acidification. The soils of the swales are deep with low fertility, but have a clay subsoil to provide nutrient and moisture retention. However, the clay also makes them susceptible to waterlogging.
Xq-	0.1	Fresh to marginally saline swamps, at least seasonally inundated.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

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

Detailed soil profile descriptions:

B2 Shallow calcareous loam on calcrete (Petrocalcic, Lithocalcic Calcarosol)
Thin stony calcareous sandy loam to clay loam, becoming more clayey and rubbly with depth, overlying calcreted calcarenite shallower than 50 cm.

B3 Shallow stony loamy sand over calcrete (Petrocalcic, Leptic Tenosol)
Loamy sand to loam with variable rubble and slight clay increase with depth overlying calcreted calcarenite shallower than 50 cm.

B4 Red sandy loam over calcrete (Petrocalcic, Red Dermosol)
Medium thickness red sandy loam grading to friable red clay loam over calcreted calcarenite within 50 cm.

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

B7a Sand over friable brown clay on calcrete (Petrocalcic, Brown Chromosol)
Medium thickness sand overlying brown friable clay on calcreted calcarenite within 50 cm.

B7b Sand over friable brown clay on calcrete (Petrocalcic, Brown Chromosol)
Medium thickness sand overlying brown friable clay on limestone or calcreted sandy clay within 50 cm.

B8 Shallow bleached sand on calcrete (Petrocalcic, Bleached-Leptic Tenosol)
Thick bleached sand over calcarenite.

F1 Sandy loam over brown clay (Hypercalcic, Brown Chromosol)
Thin to medium thickness brown loamy sand to sandy loam with a bleached A2 layer abruptly overlying a brown or dark clay, calcareous from 30 cm.

G2 Sand grading to sandy clay loam (Mesotrophic, Yellow Kandosol)
Thick bleached sand, organically darkened at surface, grading to a yellow and red friable massive sandy clay loam.

G3 Thick sand over clay (Eutrophic / Calcic, Brown Chromosol)
Thick to very thick bleached sand to loamy sand with an organically darkened surface abruptly overlying a friable yellowish brown and red sandy clay.

G4 Sand over dispersive brown clay (Hypercalcic, Brown Sodosol)
Thin to medium thickness sand sharply overlying a brown and yellow or grey mottled dispersive clay with strong columnar structure, calcareous with depth.

H3a Deep bleached sand (Basic, Arenic, Bleached-Orthic Tenosol)
Thick to very thick bleached sand, organically darkened at the surface over yellow sand continuing below 100 cm.

H3b Moderately deep bleached sand (Basic, Petrocalcic, Bleached-OrthicTenosol / Bleached, Eutrophic, Brown Kandosol)
Bleached sand with an organically darkened surface, grading to brown or yellow sand to sandyclay loam over calcreted calcarenite at variable depths below a metre

L1 Gritty sandy loam on granite (Red Kandosol / Lithic, Leptic Tenosol)
Variable thickness gritty red loamy sand to sandy loam, more clayey with depth over weathering granite.

N3 Wet soil - non to moderately saline (Dermosolic, Oxyaquic Hydrosol)
Medium thickness clay overlying a dispersive grey clay with increasing pH at depth.

Further information: DEWNR Soil and Land Program