

MIL Milang Land System

Gently undulating plains between the Angas River and the Finniss Estuary

Area: 121.7 km²

Annual rainfall: 415 – 485 mm average

Geology: The Land System is a remnant land surface which has been isolated from similar features on the Murray Plains by the alluvial valleys of the Angas River, Sandergrove Creek and the Finniss Estuary. Blanchetown Clay underlies most of the land, although it is extensively covered by clayey sands to sandy clays of the Currency Creek Formation. The Blanchetown Clay tends to occur at or near the surface in lower lying areas. These sediments are in turn partially covered by highly calcareous silty sands of the Woorinen Formation. These materials may be soft or rubbly depending on degree of exposure and moisture variations. Reworked sands (aeolian Molineaux Sand) cover parts of the landscape. Adjacent to the Angas Valley are minor flats underlain by alluvium similar to those of the modern flood plains.

Topography: The land surface is typically gently undulating. It is characterized by an irregular complex of low to moderate linear sandhills and associated swales, broad very gently undulating plains, low sandy rises, low stony rises, calcreted benches, gilgai flats and plains.

Elevation: 0 m at Lake level (near Milang) to 57 m in the north

Relief: Less than 10 m

Soils: There is a considerable range of soils, indicative of the variety of substrate materials. Sandy soils predominate - deep on sandhills, and shallow over clay on flatter ground. Loamy texture contrast soils, calcareous loams and cracking clays occupy heavier flats and low rises.

Main soils

- G4a** Shallow sand over poorly structured clay on rubble
- G4b** Sand over poorly structured clay
- B7a** Shallow sand over clay on calcrete
- A4** Deep rubbly calcareous loam
- F2** Sandy loam over poorly structured brown clay

Minor soils

Deep sandy soils on sandhills

- G2a** Bleached sand over light sandy clay loam
- G2/G3** Very thick sand over sandy clay
- H3a** Very deep bleached siliceous sand
- H3b** Moderately deep bleached siliceous sand

Sandy texture contrast soils on flats and gentle rises

- B7b** Sand over poorly structured clay on calcrete
- G1** Sand over sandy clay loam
- G2b** Thick sand over sandy clay
- G3** Thick sand over poorly structured clay



Sandy loam texture contrast soils of flats

- C1** Gradational red sandy loam
D2a Loam over red clay (over Blanchetown Clay)
D2b Loam over red clay (over alluvium)
D3 Loam over poorly structured red clay
D5 Hard loamy sand over red clay

Rubbly calcareous soils

- B2** Shallow calcareous loam on calcrete

Clayey soils of gilgai flats

- A6** Gradational calcareous clay loam
E3 Grey-brown cracking clay

Main features:

The Milang Land System is a gently undulating landscape with a complex mix of micro-topography and soils. Broad very gently undulating plains dominate the landscape. These are characterized by sandy surfaced soils shallow over dispersive clayey subsoils with calcareous rubble at shallow depth. These soils are inherently infertile, with poor root growth conditions and limited water holding capacities. The subdominant landscape features are gilgai plains and swales with substantial limitations including impeded drainage, poor root growth conditions, workability problems, boron toxicity and marginal salinity. Other soils include deep infertile, water repellent and wind erosion prone sands on sandhills, sandy loam texture contrast soils with dispersive clay subsoils, and shallow calcareous sandy loams over rubble or calcrete, with restricted water holding capacities. There are some flats with deep fertile well drained sandy loam over red clay soils, but these are limited in overall extent.

Soil Landscape Unit summary: 16 Soil Landscape Units (SLUs) mapped in the Milang Land System:

SLU	% of area	Main features #
GRA	39.9	Very gently undulating plains formed on clayey sands and sandy clays, overlain by very highly calcareous Woorinen Formation Class III carbonates, with varying amounts of rubble. Slopes are up to 2%. Low sand dunes occur sporadically. There is no surface drainage pattern and minor surface calcrete stone. Soils are generally sandy surfaced, often with rubbly calcrete at shallow depth. Main soils: <u>Shallow sand over poorly structured clay</u> - G4a (V) } on plains <u>Shallow sand over clay on calcrete</u> - B7a (L) } <u>Sand over poorly structured clay</u> - G4b (L) in depressions <u>Bleached sand over light sandy clay loam</u> - G2a (M) on sandy rises Soils have low natural fertility and restricted waterholding capacities due to the shallow depth to dispersive clayey subsoils and hostile carbonate layers. They are susceptible to wind erosion and water repellence. Most have marginally saline subsoils. Deeper sands prone to acidification.
GSB	4.7	Gently undulating rises formed on Tertiary or Pleistocene sandy clays to clays, variably calcified by soft to hard Class III carbonates of the Woorinen Formation. Slopes are up to 4% and there is minor surface calcrete. There is no defined surface drainage pattern. Soils either sandy or rubbly. Main soils: <u>Sand over sandy clay loam</u> - G1 (V) <u>Deep rubbly calcareous loam</u> - A4 (L) The sandy soils are deep to moderately deep but of low fertility and prone to wind erosion and water repellence. The calcareous soils are shallower, but are more fertile. All soils are well drained.
GxA	0.4	Depressions underlain by calcrete at shallow depth. Soils are sandy and shallow. Main soil is: <u>Shallow sand over poorly structured clay on calcrete</u> - B7b (D) These soils are marginally saline and imperfectly drained, with low fertility and waterholding capacity. Agricultural potential is very limited.



HEA HEB	2.7 4.2	<p>Very gently undulating plains, gently inclined slopes and low rises with slopes ranging from 1% to 5% underlain by Tertiary clays and alluvium, partly overlain by calcareous aeolian deposits of the Woorinen Formation.</p> <p>HEA Very gently undulating plains and valley floors with slopes of 1-2%. HEB Gently inclined slopes and low rises with slopes of 2-5%.</p> <p>Main soils: <u>Loam over red clay</u> - D2a (E) <u>Gradational red sandy loam</u> - C1 (C) <u>Hard loamy sand over red clay</u> - D5 (L) <u>Deep rubbly calcareous loam</u> - A4 (L) <u>Sandy loam over poorly structured brown clay</u> - F2 (L) <u>Gradational calcareous clay loam</u> - A6 (M)</p> <p>These soils are mostly deep and inherently fertile, although boron levels are elevated in subsoils. Poorly structured surfaces are a minor limitation in D2a and D5 soils, while shallow carbonate layers restrict rootzone depth in places. Productivity potential is high.</p>
HJA	1.2	<p>Very gently undulating plains and small depressions formed on clayey sand to sandy clay alluvium of old flood plains of the Angas - Bremer River system, overlain by Woorinen Formation carbonates, usually Classes III A and III B. The plains have less than 3 metres relief and slopes of less than 2%. There is no defined surface drainage pattern. Surface stone is minor.</p> <p>Main soils: <u>Sandy loam over red clay</u> - D5 (V) <u>Sandy loam over poorly structured red clay</u> - D3 (L) in depressions</p> <p>With the exception of the limited depressions, soils are deep, moderately fertile and well drained, with high production potential. Depressions are prone to waterlogging.</p>
HOA	1.8	<p>Level plains, adjacent to the lower reaches of the Angas River formed on Blanchetown Clay, calcified by aeolian carbonates. Slopes are less than 2%. Most soils have strongly texture contrast profiles, with sandy to loamy surfaces overlying clay subsoils which are usually mottled and dispersive. Differences are due to surface texture, and the colour and structure of the subsoil. There are limited occurrences of calcareous soils.</p> <p>Main soils: <u>Sandy loam over poorly structured brown clay</u> - F2 (E) <u>Sand over poorly structured clay</u> - G4b (E) <u>Loam over poorly structured red clay</u> - D3 (L) <u>Deep rubbly calcareous loam</u> - A4 (L)</p> <p>Impeded drainage, sub-optimal root growth conditions caused by dispersive subsoil clays at moderately shallow depth, and boron toxicity are the main limitations. Inherent fertility levels are satisfactory except for the sandy G4b soils.</p>
HZA	10.8	<p>Swales, depressions, flats and shallow drainage depressions underlain by Blanchetown Clay, calcified by aeolian carbonates. Slopes: <2%. These features represent the low lying ground in a low relief dune landscape where sand and carbonates have been reworked into rises and low dunes, with basal Blanchetown Clay remaining close to the surface in the swales and flats. Most soils have texture contrast profiles with sandy to sandy clay loam surfaces and mottled dispersive sandy clay to clay subsoils grading to highly calcareous clay (Class I carbonate) with depth. Grey and red mottled heavy clay with coarse blocky structure usually occurs within 100 cm of surface.</p> <p>Main soils: <u>Sandy loam over poorly structured brown clay</u> - F2 (E) <u>Sand over poorly structured brown clay</u> - G4b (C) <u>Loam over poorly structured red clay</u> - D3 (L) <u>Thick sand over poorly structured clay</u> - G3 (L)</p> <p>Although deep, these soils are generally imperfectly drained and have poor root growth conditions due to their dispersive clay subsoils and boron toxicity. Natural fertility levels are moderate (loamy soils) and low (sandy soils).</p>



HaA	0.3	<p>Outwash fans, plains and shallow drainage depressions with slopes of up to 6%, formed on alluvial clays, weakly calcified. Moderately well defined watercourses traverse the fans at widely spaced intervals.</p> <p>HaA Flat plains and drainage depressions with slopes of 0-1%. Soils are mixed hard setting and sandy texture contrast types.</p> <p>Main soils: <u>Loam over poorly structured red clay</u> - D3 (E) <u>Sand over poorly structured clay</u> - G4a (E) <u>Sandy loam over poorly structured brown clay</u> - F2 (L) <u>Loam over red clay</u> - D2 (M)</p> <p>These soils are deep but most have poorly structured dispersive subsoils which impede water movement and restrict root growth. On slopes, the soils are susceptible to water erosion. Fertility is moderate (loamy types) to low (sandy types).</p>
O-B O-C O-D	1.1 6.0 0.8	<p>Low to moderate sandhills and low sand spreads formed on Molineaux Sand.</p> <p>O-B Moderate longitudinal dunes up to 10 m high with side slopes of 2-5%. Main soils: <u>Very deep bleached siliceous sand</u> - H3a (D) <u>Moderately deep bleached siliceous sand</u> - H3b (M)</p> <p>O-C Low longitudinal dunes and low irregular rises less than 5 m high and with side slopes of up to 4%. Main soils: <u>Bleached sand over light sandy clay loam</u> - G2a (V) <u>Very thick sand over sandy clay</u> - G2/G3 (L)</p> <p>O-D Gently undulating rises up to 10 m high with slopes of 2-3%. Main soils: <u>Moderately deep bleached siliceous sand</u> - H3b (E) <u>Thick sand over sandy clay</u> - G2b (E) <u>Very deep bleached siliceous sand</u> - H3a (M)</p> <p>These soils are deep and very sandy with consequent low inherent fertility, and high susceptibility to water repellence and wind erosion.</p>
SdB	4.9	<p>Low benches and gently undulating low rises with relief of less than 10 metres and slopes of less than 4%, formed on rubbly to sheet calcrete, mostly Classes III C, III B and II, overlying Tertiary sands to sandy clays, or Pleistocene heavy clays. Surface calcrete stone is common and there is minor sheet rock outcrop. There is no surface drainage pattern. Most soils are calcareous throughout with rubble at shallow depth. There are some red texture contrast types.</p> <p>Main soils: <u>Deep rubbly calcareous loam</u> - A4 (E) <u>Shallow calcareous loam on calcrete</u> - B2 (E) <u>Gradational red sandy loam</u> - C1 (M) <u>Loam over red clay</u> - D2a (M)</p> <p>These soils are well drained and moderately fertile, but waterholding capacity is commonly restricted by shallow rubble or sheet rock. Workability is a limitation in places due to surface stone.</p>
SiA	8.9	<p>Low rises with slopes of less than 3% and relief of less than 10 metres, formed on highly calcareous sandy clays with abundant soft carbonates and nodules (Class III A carbonate), usually overlying Tertiary sandy to clayey sediments or Pleistocene (Blanchetown) clays. There is limited surface stone and no surface drainage pattern.</p> <p>Main soils: <u>Deep rubbly calcareous loam</u> - A4 (E) <u>Shallow sand over clay on calcrete</u> - B7a (C) <u>Shallow calcareous loam on calcrete</u> - B2 (C) <u>Gradational red sandy loam</u> - C1 (L) <u>Gradational calcareous clay loam</u> - A6 (M)</p> <p>These soils are generally well drained with moderate to low fertility. Restricted waterholding capacity caused by calcrete rubble at shallow depth is a problem in places, but overall productive potential is moderate to high.</p>
THA	12.2	<p>Flat plains and swales underlain at shallow depth by Blanchetown Clay. Gilgai microrelief is characteristic of these landscapes. Soils vary considerably over short distances as a result of seasonal clay movement.</p> <p>Main soils: <u>Grey-brown cracking clay</u> - E3 (E) <u>Sandy loam over poorly structured brown clay</u> - F2 (C) <u>Sand over poorly structured clay</u> - G4b (L) <u>Gradational calcareous clay loam</u> - A6 (L)</p> <p>Impeded drainage, poor root growth conditions, uneven land surface, workability problems, boron toxicity and marginal salinity combine to affect the productive potential of this land.</p>



ZA-	0.1	<p>Saline flats and lunettes.</p> <p>ZA- Moderately to highly saline flats.</p> <p>ZC- Samphire flats with 10-20% bare salt pans.</p> <p>Main soils: <u>wet saline clay loam</u> - N2/M2, <u>saline sandy loam over black clay</u> - N2/F2 and <u>marly saline calcareous sandy loam</u> - N2/A7 (E-V), with <u>black cracking clay</u> - E1 (M-E) subdominant on moderately saline land. The flats are non arable, and a significant proportion is bare or carries only light cover. Opportunistic grazing is an option, but care must be taken to minimize damage to vegetation. Seeding of these areas to salt tolerant grasses or revegetating with suitable perennials should be considered. These saline flats are at risk of developing acid sulfate conditions. Advice should be sought before any attempt at drainage.</p>
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PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

(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:

- A4** Deep rubbly calcareous loam (Regolithic, Supracalcic Calcarosol)
 Medium thickness brown calcareous loamy sand to light sandy clay loam with minor calcrete nodules, overlying a brown highly calcareous massive sandy clay loam, grading to a pale brown, very highly calcareous clayey sand to light clay with up to 50% calcrete nodules (Class III B carbonate). The carbonate layer grades to a brown, yellow, grey and red sandy clay from 65 cm.
- A6** Gradational calcareous clay loam (Regolithic, Calcic Calcarosol)
 Medium thickness grey brown or red brown moderately calcareous sandy loam to sandy clay loam, becoming more clayey and calcareous with depth, overlying a brown to red, highly calcareous sandy clay loam to light clay, grading to a pale brown very highly calcareous sandy clay with up to 50% soft carbonate segregations (Class I carbonate) which grades to Blanchetown Clay at 80 cm.
- B2** Shallow calcareous loam on calcrete (Petrocalcic, Supracalcic Calcarosol)
 Medium thickness brown moderately calcareous loamy sand to light sandy clay loam with variable calcrete fragments, overlying sheet calcrete or heavy rubble grading to soft very highly calcareous pale brown sandy loam to clay loam with decreasing rubble content. The profile overlies Blanchetown Clay at depths from 100 cm to 10 m.
- B7a** Shallow sand over clay on calcrete (Petrocalcic, Brown Chromosol)
 Thin brown sand to sandy loam with a pink A2 horizon, overlying orange sandy clay loam to light clay with calcrete fragments. At 30 cm is a layer of massive or rubbly calcrete, grading to a pale brown very highly calcareous clayey sand to sandy clay.
- B7b** Shallow sand over poorly structured clay on calcrete (Lithocalcic, Brown Sodosol)
 Medium thickness dark brown sand to light sandy clay loam with a pale brown A2 horizon, overlying a dark brown and yellow sandy clay loam to light clay with coarse columnar, grading to coarse blocky structure. The profile is formed on a rubbly or platy calcrete pan (Class III C carbonate) from 40 cm. Under the pan is a yellow and grey highly calcareous clay.
- C1** Gradational red sandy loam (Supracalcic, Red Kandosol)
 Medium thickness reddish loamy sand to light sandy clay loam grading to a red brown weakly structured sandy clay loam to light clay, over a highly calcareous layer with abundant Class III B carbonate nodules from 30 cm. Brown, yellow, red and grey clayey sand to sandy clay underlies the carbonate at 70 cm.



- D2a** Loam over red clay (Sodic, Hypercalcic, Red Chromosol)
Medium thickness red brown loamy sand to clay loam with weak structure, overlying a dark reddish brown clay with strong blocky structure, highly calcareous from 30 cm, with abundant soft carbonate segregations. The carbonate grades to Blanchetown Clay at 90 cm.
- D2b** Loam over red clay (Hypercalcic, Red Chromosol)
Medium thickness brown loamy sand to light sandy clay loam, overlying a dark reddish brown to orange massive sandy clay, very highly calcareous with limited hard nodules (Class III A carbonate) from 40 cm. Brown, red and grey clayey sand to sandy clay alluvium underlies the profile from 85 cm.
- D3** Loam over poorly structured red clay (Calcic, Subnatric, Red Sodosol)
Medium thickness reddish brown massive sandy loam to fine sandy clay loam with a paler A2 horizon, overlying a reddish brown and greyish brown mottled clay with strong blocky structure and soft Class I carbonate segregations from 55 cm. The soil overlies a dark brown mottled clay with decreasing amounts of carbonate.
- D5** Hard loamy sand over red clay (Hypercalcic, Red Chromosol)
Medium thickness hard massive loamy sand to sandy loam overlying a yellowish red massive sandy clay to light clay, highly calcareous with depth, grading to clayey sand to sandy clay at 70 cm.
- E3** Grey-Brown cracking clay (Episodic-Epicarcareous, Pedal, Brown Vertosol)
Thin grey brown, moderately calcareous coarse blocky clay, overlying a yellow brown and brown mottled calcareous heavy clay with coarse blocky structure, and soft carbonate segregations from 25 cm (Class I carbonate). The carbonate grades to Blanchetown Clay at 35 cm.
- F2** Sandy loam over poorly structured brown clay (Calcic, Mottled-Subnatric, Brown Sodosol)
Medium thickness grey brown massive hard loamy sand to sandy clay loam with a paler and sandier A2 horizon, overlying a brown, grey and yellow heavy clay with strong blocky structure, highly calcareous from 50 cm (Class I carbonate layer). The carbonate grades to Blanchetown Clay at 70 cm.
- G1** Sand over sandy clay loam (Lithocalcic, Mottled-Subnatric, Brown Sodosol)
Very thick pale brown loose sand, overlying a yellowish brown and red mottled clayey sand to light sandy clay loam, grading to sandy clay loam with soft to rubbly Class III carbonate from 85 cm. The profile becomes sandier with depth.
- G2a** Bleached sand over light sandy clay loam (Bleached-Sodic, Calcic, Yellow Kandosol)
Very thick white sand, organically darkened at the surface, overlying a reddish yellow, massive clayey sand to light sandy clay loam with limited soft calcareous segregations (Class IV carbonate) from 90 cm, becoming sandier with depth.
- G2b** Thick sand over sandy clay (Sodic, Calcic, Brown Chromosol)
Thick to very thick dark brown sand with a bleached A2 horizon, overlying a reddish yellow massive to coarsely prismatic sandy clay to clay, grading to brown, red and yellow massive clayey sand at 80 cm.
- G2/G3** Very thick sand over sandy clay (Mesotrophic / Calcic, Brown Chromosol)
Very thick pale brown sand, overlying an orange sandy clay loam to light clay with weak columnar structure, grading to a yellow, red and brown clayey sand to sandy clay from 110 cm.
- G3** Thick sand over poorly structured clay (Calcic, Brown Sodosol)
Thick grey sand with a strongly bleached A2 horizon, overlying a yellowish brown, brown and red mottled sandy clay with coarse columnar structure, more clayey with depth, and highly calcareous (Class I carbonate) from 80 cm.



- G4a** Shallow sand over poorly structured clay (Supracalcic, Subnatric, Brown Sodosol)
Medium thickness brown sand with a thin bleached A2 horizon, overlying a brown and red columnar sandy clay becoming more clayey and massive with depth, grading to a very highly calcareous pale brown clayey sand to sandy clay with up to 50% carbonate nodules (Class III A or B carbonate). This is underlain by a brown, yellow, grey and red sandy clay from 70 cm.
- G4b** Sand over poorly structured clay (Calcic, Mottled-Mesonatric, Brown Sodosol)
Medium thickness brown sand to light sandy clay loam with a hard massive bleached A2 horizon, overlying a brown, grey and red mottled clay with coarse columnar structure, calcareous with soft carbonate segregations from 45 cm (Class I carbonate). The carbonate grades to sandy clay or heavy clay (Blanchetown Clay) at 60 cm.
- H3a** Very deep bleached siliceous sand (Basic, Arenic, Bleached-Orthic Tenosol)
Very thick white loose sand, organically darkened at the surface, overlying a yellow loose sand, grading to a pale brown sand from 125 cm.
- H3b** Moderately deep bleached siliceous sand (Basic, Arenic, Bleached-Orthic Tenosol)
Thick white sand, organically darkened at the surface, overlying a yellow sand grading to a buried sand over clay soil at variable depths below 100 cm.

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

